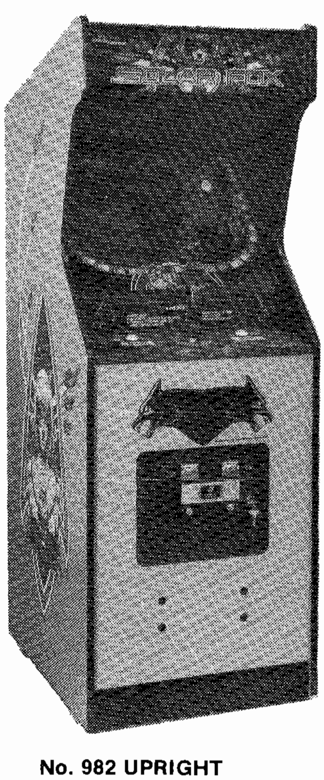
September, 1982
Game Nos. 982, 578, 580

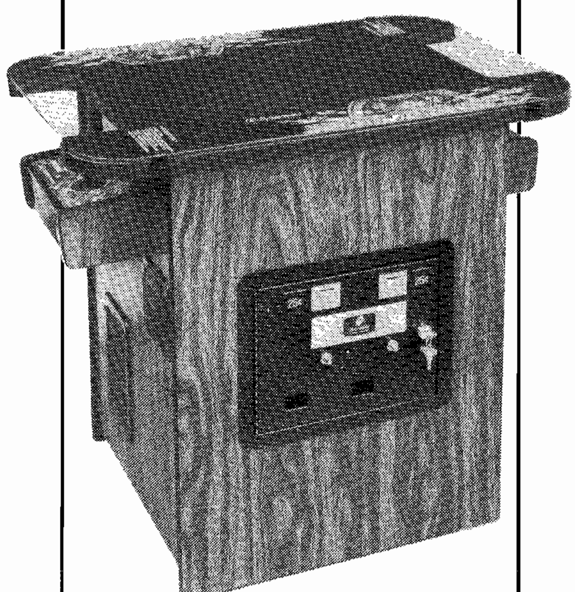
Bally/Midway's

SOLAR FOX

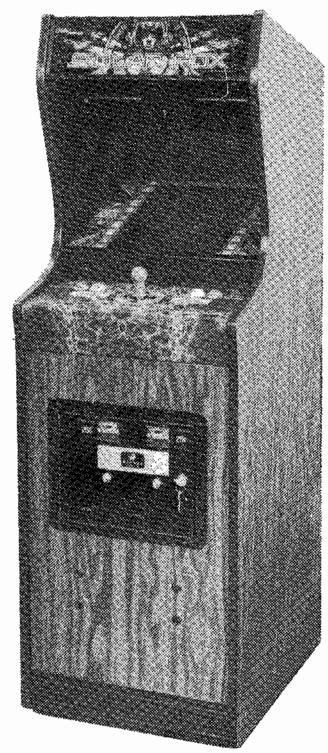
Parts & Operating Manual



No. 982 UPRIGHT



NO. 580 COCKTAIL



NO. 578 MINI

Bally

MIDWAY MFG. CO.

10750 W. Grand Avenue
Franklin Park, Illinois 60131
U.S.A.

Phone: (312) 451-1360 Cable Address: MIDCO Telex No.: 72-1596

Form No. 0982-00300-0000

WARNING
THIS GAME MUST BE GROUNDED. FAILURE TO DO SO MAY RESULT IN DESTRUCTION TO ELECTRONIC COMPONENTS.

WARNING: This equipment Generates, Uses and can Radiate Radio Frequency Energy and if not installed and used in accordance with the Instructions Manual, may cause interference to Radio Communications. As temporarily permitted by Regulation it has not been tested for compliance to Subpart J or Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference. Operation of this equipment in a Residential Area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

ELECTRICAL BULLETIN: FOR ALL APPARATUS COVERED BY THE CANADIAN STANDARDS ASSOCIATION (CSA) STANDARD C22.2 NO. 1, WHICH EMPLOYS A SUPPLY CORD TERMINATED WITH A POLARIZED 2-PRONG ATTACHMENT PLUG.

CAUTION: TO PREVENT ELECTRIC SHOCK DO NOT USE THIS (POLARIZED) PLUG WITH AN EXTENSION CORD, RECEPTACLE OR OTHER OUTLET UNLESS THE BLADES CAN BE FULLY INSERTED TO PREVENT BLADE EXPOSURE.

ATTENTION: POUR PREVENIR CHOCS ELECTRIQUES NE PAS UTILISER CETTE FICHE POLARISEE AVEC UN PROLONGATEUR. UNE PRISE DE COURANT OU UNE AUTRE SORTIE DE COURANT, SAUF SI LES LAMES PEUVENT ETRE INSEREES A FOND SANS EN LAISSER AUCUNE PARTIE A DECOUVERT.

Printed in U.S.A.

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Solar Fox

IMPORTANT NOTE

DO NOT plug in your new game yet. Before you do anything to your game, we recommend that you read SECTIONS I and II of this manual completely. It will not take more than a few minutes and it may be very helpful.

I. Introduction

SOLAR FOX is a one or a two player game. There are three models: the "UPRIGHT", "MINI", and "COCKTAIL TABLE". The Upright and Mini models have been designed for either **RIGHT** or **LEFT** hand use. When the two player mode is selected on the Upright or Mini model, the players take turns at the controls to take the Ship through the game course. If you have purchased the Cocktail Table model of this game, the rules of play are the same. The only **difference** is that in the two player mode of the Cocktail Table game, the picture flips to face you when it's your turn.

When playing this game, the Ship is under **YOUR** control. **YOU** make it move back and forth or up and down on the screen to eliminate the Fuzors, Pulzors, and to disable the Yellow Thrustors while building up your score. To disable all 4 Thrustors at once, you must either run over or shoot the Freezor as it works its way across the screen.

These Fuzors are displayed in various patterns across the entire playing field of the screen. Each pattern is called a "rack". The first rack is made up of Fuzors arranged in the shape of a large number "0". The second and all future racks are made up of Fuzors arranged in evermore difficult patterns.

At random times during each rack, a special blinking Pulzor will appear for a short time. If you eliminate this special blinking Pulzor before it disappears, you earn BONUS POINTS. (The value of these bonus points is printed out on the screen as you eliminate the Pulzor.)

ALL of the above must be accomplished while avoiding being hit by one of the many small Vortices shot at you by each of the four Thrustors. One of these Thrustors patrols **EACH** edge of the monitor screen: left, right, top, and bottom. This will really test your skill because you can have a lot of Vortices coming at you from **four DIFFERENT directions** at the **SAME time.**

As your skill level increases and you work your way into the higher and higher racks: the Fuzors must be run over twice by your Ship before they are eliminated, their pattern is more varied, the number of Vortices shot at you is increased, the speed and distance the Vortices travel is increased, and the Thrustor's aim gets better.

Bonus Ships are awarded to you periodically throughout the game as you reach or pass certain preselected rack numbers. Each item in the game that can be scored on has an assigned point value as listed in Figure 1-1.

Major Features

There are several major features in your SOLAR FOX game: 1) The UPRIGHT and MINI models have been designed for ease of play by EITHER **RIGHT HANDED** or **LEFT HANDED** players; 2) You can select the level of difficulty at which you want to play (NOVICE or EXPERT); 3) You can vary the speed at which your Ship travels through the game course by pressing **AND HOLDING DOWN** the SPEED CONTROL Button; 4) Fuzor value increases by racks. See Figure 1 for details. 5) The game has OWNER/OPERATOR selected variable levels of difficulty so game play can be tailored to player skill level in his area; 6) a bonus system which allows the player to skip a rack while receiving all the points for the "skipped" rack when the player successfully completes the current rack **BEFORE** a time limit runs out; 7) There is a new and easy to use diagnostic package featuring: a complete ROM/RAM check with bad chip location information read out on the monitor screen; the capability to check each of the game's 15 different sounds **INDIVIDUALLY;** provision for checking each control and switch **SEPARATELY;** a full function Bookkeeping mode; an entire options list that can be set from the front console with **NO NEED** to crawl inside the back of the cabinet and look for tiny switches located on P.C. boards; a sound system test; and a "PRE-SET" category that can return **ALL** information in the Bookkeeping mode to zero and/or all operator selected options back to factory recommended settings; and 8) The game is equipped with a rechargeable battery so that it won't forget where it was the night before at closing — even if you turn it off. It will "remember" this information for up to two weeks.

Game Objective

The object of the game is to **HAVE FUN** while constantly increasing your skill as you play, running over and/or shooting as many scoreable objects as possible each time to get the highest score.

DESCRIPTION	POINTS AWARDED	NOTES
VORTEX	300 POINTS EACH	
ENERGY FIELDS	100 POINTS EACH	**ONLY** WHEN SHOT BY YOUR SHIP. **NO** POINTS ARE AWARDED IF YOU **RUN INTO** ONE WITH YOUR SHIP
FUZOR	30 POINTS EACH	INCREASES BY 10 POINTS EVERY 3 RACKS **MAXIMUM VALUE 90 POINTS**
PULZOR	200 TO 800 POINTS EACH	CALLED OUT ON SCREEN AT TIME OF AWARD
RED THRUSTOR YELLOW THRUSTOR	100 POINTS EACH TIME 200 POINTS EACH TIME	
SKIPRACK TIMER BONUS POINTS	100 POINTS FOR EACH SQUARE LEFT ON IT AT END OF RACK	"BEGINNING TIME" VARIES DEPENDING ON DIFFICULTY OF RACK PATTERN. **THIS DOES NOT APPLY IN CHALLENGE RACK**
CHALLENGE RACK BONUS POINTS	1000 POINTS FOR CHALLENGE RACK NO. 1	INCREASES BY 600 POINTS FOR EACH ADDITIONAL CHALLENGE RACK CLEARED UNTIL YOU REACH NO. 12 @ 7,600 POINTS. THIS THEN REPEATS.

Figure 1-1 Assigned Point Values

II. Location and Setup

INSPECTION:

1. Remove the game from its shipping crate.
2. Inspect the entire outside of it for any signs of damage.
   - ☐ Any scratches?, dents?, cracks?
   - ☐ Any broken controls?
   - ☐ Any broken glass or plastic?
   - ☐ Just look it over closely and make a note of any signs of damage.
3. Remove the shipping cleats from the bottom of the cabinet.
4. Install the four levelers, one at each corner of the cabinet.
   - ☐ Level the cabinet.
5. Open the cabinet and inspect the inside of the game for any signs of damage. See Figure 2-1.
   - ☐ Also check to make sure all plug-in connectors on the wire harness are firmly seated.

> **NOTE:** ALL connectors or plugs are keyed so they will only go together when all pins are properly lined up.

   - ☐ Replug any connectors found unplugged. DO NOT FORCE PLUGS ONTO CONNECTORS. DO NOT FORCE PLUGS TOGETHER. If it won't go on easily, assuming the keys are lined up, it either does not belong there or is damaged.
   - ☐ Make sure all printed circuit boards (P.C.B.'s) are firmly seated in their connectors. See Figure 2-1. These connectors are also keyed. The P.C.B.'s will only go into them one way without being damaged.
   - ☐ Note the location of the game's serial number. See Figure 2-1.
   - ☐ Check all major subassemblies to be sure they are mounted securely. These are called out in Figures 2-1 & 2-2.
     Power supply.
     Control panel(s).
     T.V. monitor.
     Other P.C.B.'s and/or P.C.B. rack, etc.
     Power supply filter assembly.
     Transformer board assembly.
6. Make a note of any problems that can't be easily corrected.
7. Call your distributor and/or service man about your problem list.

INSTALLATION:

1. **Location requirements:**
   - ☐ **Power:**
     Domestic 110 V @ 60 Hz
     Foreign 200 V to 240 V @ 50 Hz
   - ☐ **Temperature:** 32° to 100° F (0° to 38° C)
   - ☐ **Humidity:** Not over 95% relative
   - ☐ **Space required:**

Upright	25" x 32" (63 x 81cm)
Mini	20" x 24" (50 x 60cm)
Cocktail	32" x 22" (81 x 55cm)

   - ☐ **Game height:**

Upright	70" (175cm)
Mini	61" (153cm)
Cocktail	29" (73cm)

2. **Voltage Selection:**

   Your game is designed to work properly on the line voltage where you are located. Check your line voltage with a meter to determine what its value is. Then check the power input wires to the main power supply transformer on your game to be sure they are connected to taps which correspond to your line voltage value.

   If the power input wires to the main power supply transformer are not connected to taps which correspond to your local line voltage, move them to the proper taps.

   If the line voltage in your area falls outside the upper or lower limits of the range of inputs covered by the main power supply transformer, **DO NOT PLUG YOUR GAME IN** until you have talked with your distributor and/or service man and obtained a solution to this problem. Otherwise you could damage your game.

3. **Interlock and power ON/OFF switches.** See Figure 2-1.
   - ☐ To help prevent the possibility of getting an electric shock while working inside the game cabinet, interlock switches have been installed at each cabinet access door (this **DOES NOT** include the coin door in the Upright and Mini models).
   - ☐ When any access door is opened, the interlock switch installed there turns off all power to the game.
   - ☐ Check each interlock switch for proper operation.
     After checking the line voltage in your area and determining that the input wires to the main power supply transformer of your game are

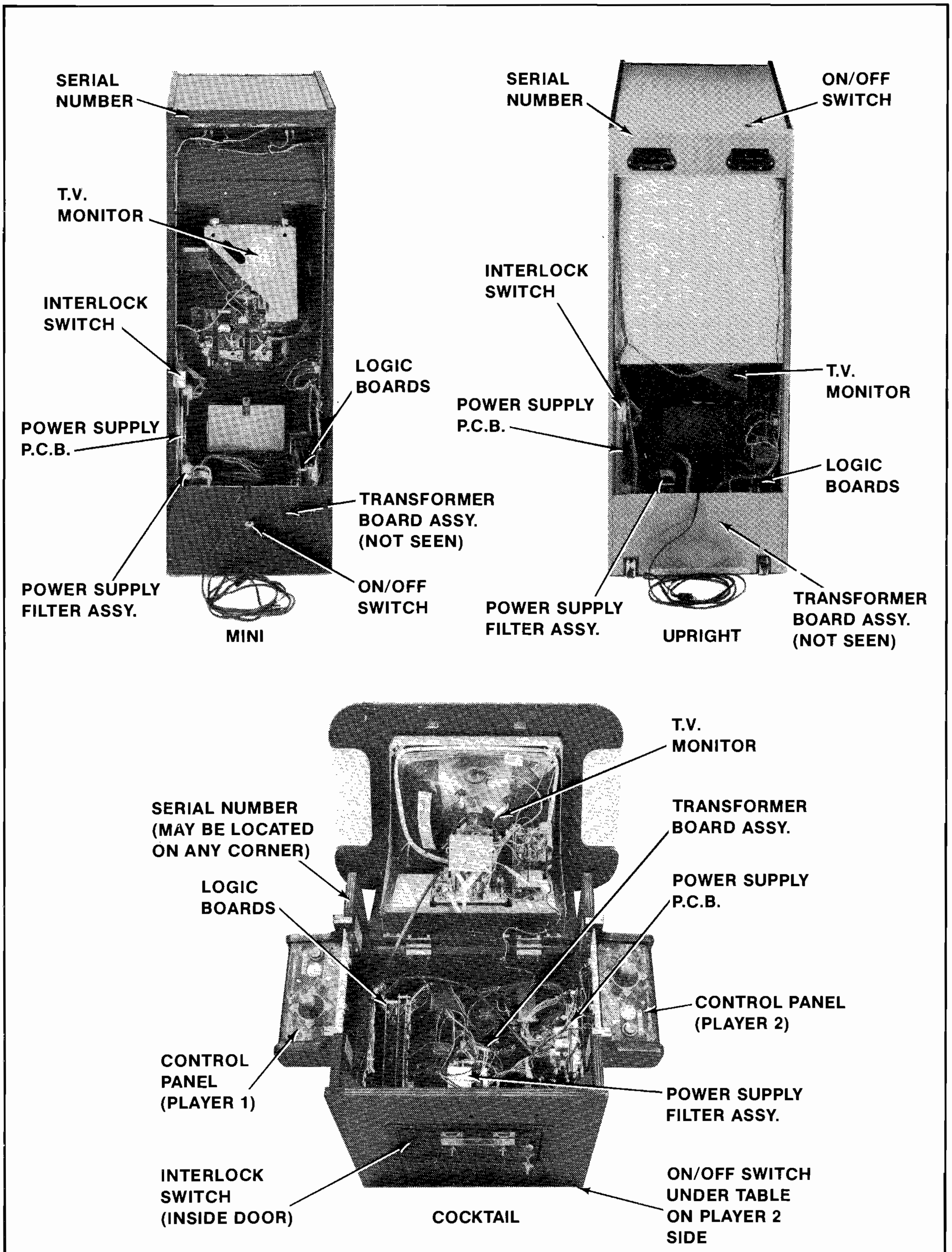


Figure 2-1 Location of Serial No., Interlock Switch, On/Off Switch, & Major Sub-Assys.

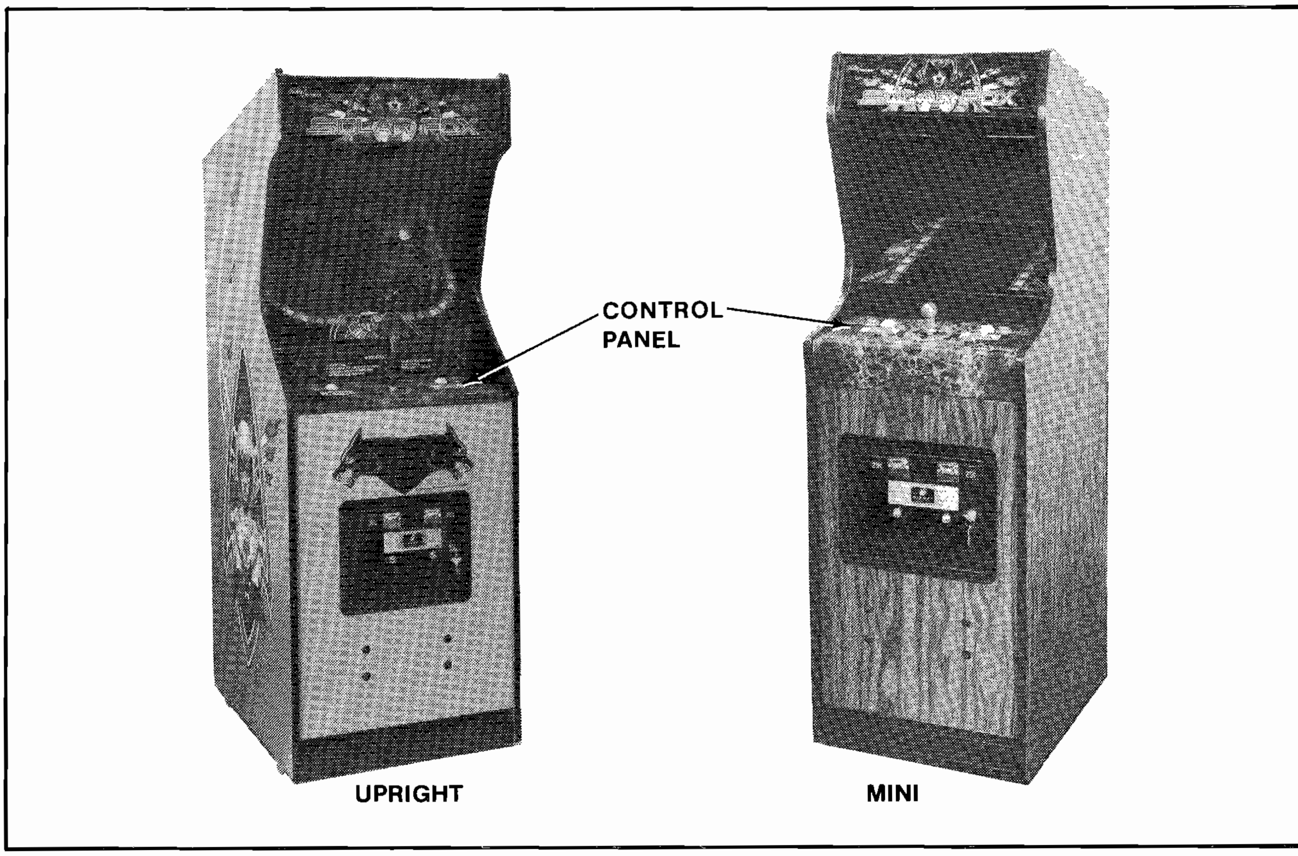


Figure 2-2 Major Sub Assys. (cont. from Fig. 2-1)

connected properly — or — after obtaining a solution to your over or under voltage problem from your distributor and/or your service man, plug the game into your A.C. wall outlet.

The game ON/OFF switches for all models are located as shown in Figure 2-1. Turn the game on and allow it to warm up a few minutes.

Slowly open each access door to the game (this does not include the coin door on the Upright and Mini models).

As the door is opened approximately 1" (2.54cm) the power to the game should go off (the T.V. monitor, all the lights, and all sounds will stop).

If this does not happen, check the interlock switch by this door to see if it has broken loose from its mounting or if it is stuck in the "ON" position.

If the switch is found to be bad, turn the game off, unplug it, and replace the interlock switch. When done, plug the game back into the wall outlet, close the access door, and turn the game back on.

After the game has warmed up, repeat the above interlock switch test.

When the interlock switch is working properly and turns the power to the game off, power may be restored to the game with the access door(s) open. Take hold of the interlock switch plunger and **gently** pull it out to its fully extended position. THIS IS TO BE USED **ONLY** FOR SERVICING THE GAME. See Figure 2-3.

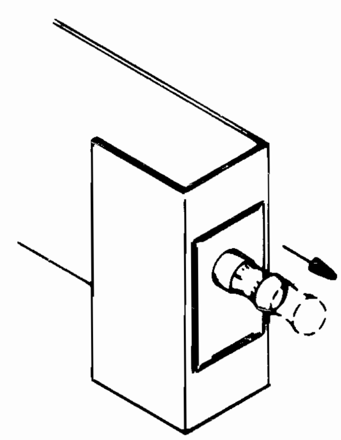


Figure 2-3 Interlock Switch Operation

SELF-TEST:

Your new game will Self-Test itself to see if it has any bad parts. The information it receives while testing itself will be shown on the T.V. monitor. Some information can also be heard through the game's speaker system. See the GAME OPERATION section for a more detailed description of this function.

When there is a bad result according to the Self-Test, call your distributor and/or service man to have the trouble fixed unless it is something you can do yourself (such as replace a bad RAM or ROM chip).

GAME VOLUME ADJUSTMENT CONTROL. See Figure 2-4.

The game volume control pot is located just inside the cabinet on the right side of the coin door frame. There is only one pot. For adjustment, it may be reached through the coin door on **ALL** models.

To make the sound louder, turn the pot clockwise as you face it (↷).

To make the sounds **less** loud, turn the pot counter-clockwise as you face it (↶).

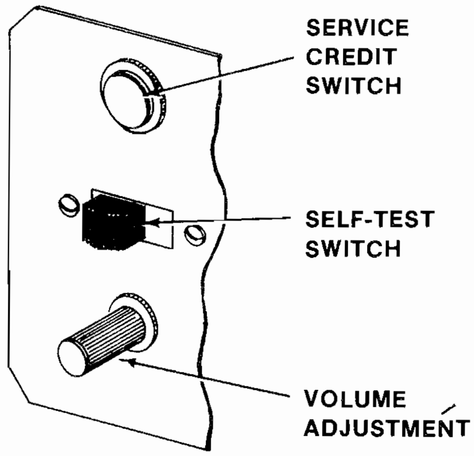


Figure 2-4 Location of Volume Control

OPTION SETTINGS:

To change the most common option settings, you **DO NOT** have to take the game apart or go into the cabinet and hunt for tiny switches on P.C. boards. These most common options can be changed from the main console of the game while it is in the Self-Test mode. The Self-Test switch is located just inside the cabinet on the right side of the coin door frame as you face it.

When changing any options, ALWAYS perform the Self-Test and play the game to be sure the ones selected are working properly. Of course, when you must change one of the switches that is located on one of the game's P.C. boards, it is also recommended that you perform the Self-Test and play the game to be sure the switches have worked properly and that no switches were accidentally moved that were not meant to be. (These switches are small and this can happen.)

The P.C. Board option switch settings and what they will make the game do are shown in Figure 2-6. These switches are **MAINLY INTENDED** for use by a technician who is checking and/or performing tests on the game. See Figure 2-5 for option switch locations.

NOTE: In order to set the option switches located on the game's P.C. Boards, these Boards need not be removed from their card rack.

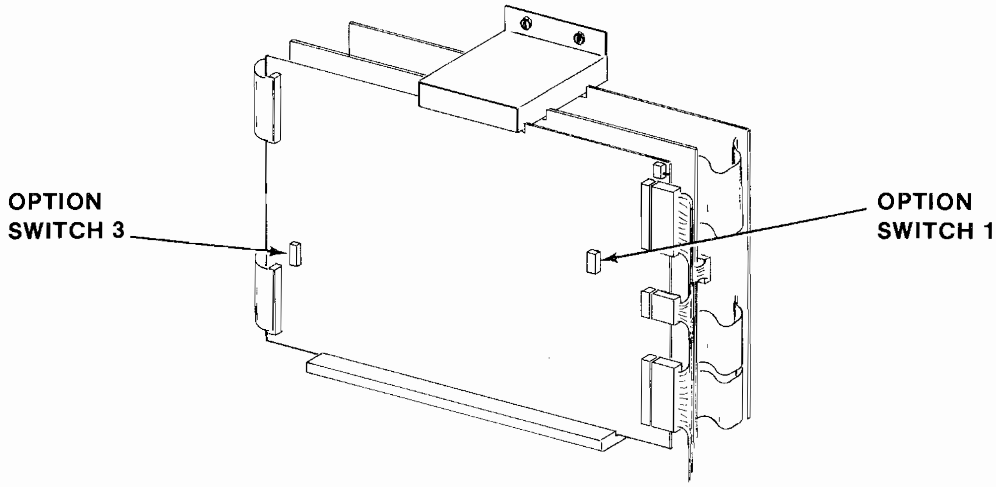


Figure 2-5 Option Switch Locations

SOLAR FOX

OPTION SWITCH SETTINGS

SWITCH NO. 1 — AT B 3 — LOCATED ON SOUND I/O P.C. BOARD	SW#1	SW#2	SW#3	SW#4	SW#5	SW#6	SW#7	SW#8	SW#9	SW#10
NO BONUS BASE AWARDED	ON		NOT	NOT		NOT			NOT	
BONUS BASE AWARDED	OFF**		USED	USED		USED			USED	
BONUS BASE AWARDED AFTER **EVERY 20th RACK COMPLETED**		ON								
BONUS BASE AWARDED AFTER EVERY 10th RACK COMPLETED		OFF								
SOUND PROVIDED IN ATTRACT MODE (LASTS ABOUT 1 MINUTE)					ON					
NO SOUND PROVIDED IN **ATTRACT MODE**					OFF					
IGNORE HARDWARE FAILURE **ONLY USED FOR DEVELOPMENT**							ON			
HARDWARE FAILURE DETECTION							OFF**			
COCKTAIL TABLE								ON		
UPRIGHT								OFF		
FREEZE VIDEO										ON
NORMAL OPERATION										OFF**

SWITCH NO. 3 — AT D 14 — LOCATED ON SOUND I/O P.C. BOARD	SW#1	*SW#2	*SW#3	*SW#4
NORMAL OPERATION	OFF**			
SOUND I/O DIAGNOSTIC MODE	ON			
NORMAL OPERATION		OFF**		
RAM/ROM TEST INDICATES TEST RESULTS VIA YELLOW LED ON SOUND I/O BOARD: **FAST FLASH = BAD ROM** **SLOW FLASH = BAD RAM**		ON		
NORMAL OPERATION			OFF**	
OSCILLATOR TEST			ON	
NORMAL OPERATION				OFF**
FILTER TEST				ON

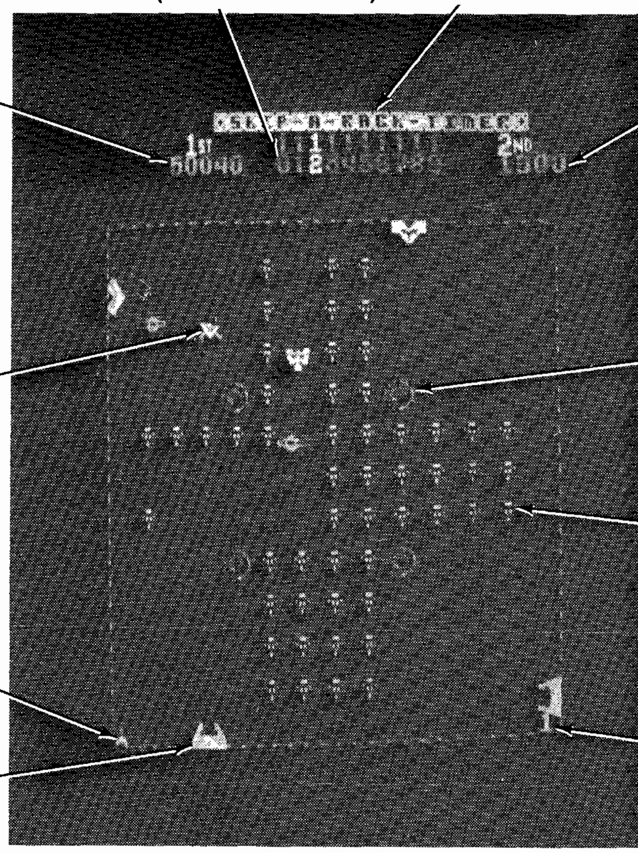
*NO EFFECT IF SW#1 OF SWITCH NO. 3 IS IN THE "OFF" POSITION.
**INDICATES FACTORY SETTINGS OF ABOVE SWITCHES.

Figure 2-6 Option Switch Settings

III. Game Operation

SOLAR FOX is a one or a two player game with a color T.V. monitor. The game gives a display which has all the parts shown below.

The game has five possible modes of operation: ATTRACT, READY-TO-PLAY, PLAY, HIGH SCORE INITIAL, and SELF-TEST.



Identification of "On Screen" Graphics During Play

SELF-TEST MODE

The Self-Test mode is a special mode for checking game play statistics as well as game switches and computer functions. It is the easiest and best way to check for proper operation of the entire game.

NOTE: Putting the game into Self-Test **WILL NOT** cause the game to erase any CREDITS it has in its memory when the Self-Test mode is entered.

You may begin a Self-Test at any time by sliding the Self-Test switch to the "ON" position after the power to the game is on (the Self-Test switch is located just inside the cabinet on the right side of the coin door frame as you face it). When this is done, the game will react as follows:

1. If the game is in the Attract mode when the Self-Test switch is moved to the "ON" position, it will finish the sequence and then go into the Self-Test mode. This is illustrated by the display of the Self-Test Mode Menue on the monitor screen.

2. If the game is in the Ready-To-Play mode or the Play mode when the Self-Test switch is slid to the "ON" position, it **WILL NOT** go into the Self-Test mode until **AFTER** the player's last ship has been destroyed (the game MUST be over). At this point, the game will go into the Self-Test mode. Again, this is illustrated by the display of the Self-Test Mode Menue on the monitor screen.

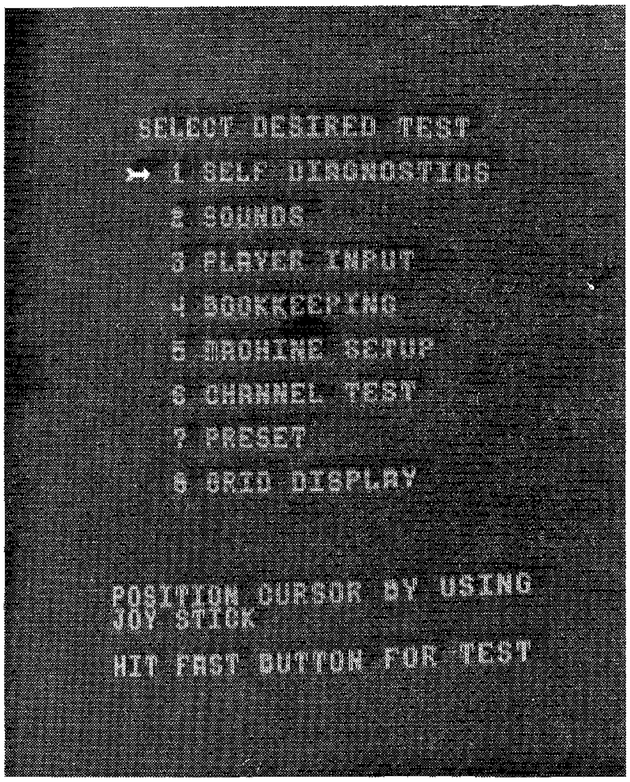


Figure 3-1 Self-Test — Menue

3. The fastest way to enter the Self-Test mode is to slide the Self-Test switch to the "ON" position and then activate the "TILT" switch located on the back side of the coin door just below the lock mechanism. The game will then **IMMEDIATELY** go into the Self-Test mode.

The Self-Test mode has eight (8) major categories as illustrated by Figure 3-1.

1. It is easy to select what category you want to enter. By pushing the control stick forward or pulling it back, the Arrow (Cursor) at the left of the screen can be moved UP and DOWN, (forward= UP) and (backward = DOWN), until it is in front of the category you want to test. Release the control stick at this time.
2. After the Arrow has been positioned, depress either "SPEED CONTROL" Button on the console and the monitor screen will display the test category you have selected.
   - ☐ Once you are **IN** one of the Self-Test mode categories, FOLLOW THE **ON-SCREEN** INSTRUCTIONS TO **COMPLETE** THE TEST.
3. The next group of Figures (3-2 through 3-9) show the **CORRECT** screen presentation for **EACH** category of the Self-Test mode.

During the SELF-DIAGNOSTICS section of the Self-Test mode, you will **first** see a cross hatch pattern on the screen for about 1/2 second. **Second,** you will see a lot of different colored bars shown on the monitor screen. These bars will be **UNpainted** one at a time from the top down. **Third,** you will see the screen painted Red, Blue, and Green in bars from the top down. **Fourth,** all the different colored bars you saw **"Second"** are displayed again. And **fifth,** the different colored bars are replaced by this message: **"HIT SPEED CONTROL BUTTON TO EXIT".** If the SPEED CONTROL Button is not hit, the test will repeat itself. This feature was designed into the game to enable over-night testing for an intermittent hardware problem.

If the SELF DIAGNOSTICS find one or more bad ROM or RAM chips: instead of going through what is described above, the game will give you a written message as to which parts are bad. This message includes their I.D.'s and their P.C. Board locations.

During the SOUNDS section of the Self-Test mode, the game will give a display which looks like that shown in Figure 3-2.

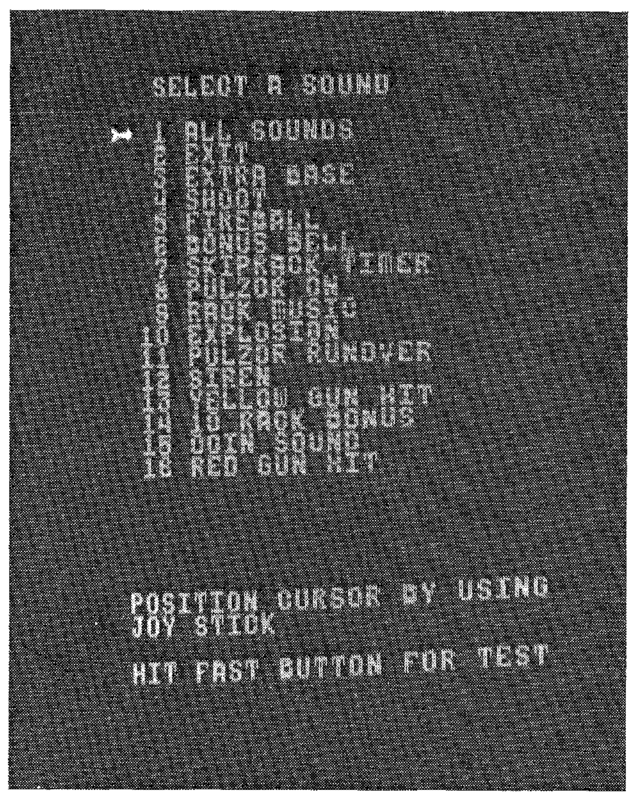


Figure 3-2 Self-Test — Sounds

☐ In this category, each of the game's 13 separate sounds can be checked individually in any order — or — you can tell the game to check them all in order — 3 through 17.

During the PLAYER INPUT section of the Self-Test mode, the game will give a display which looks like that shown in Figure 3-3.

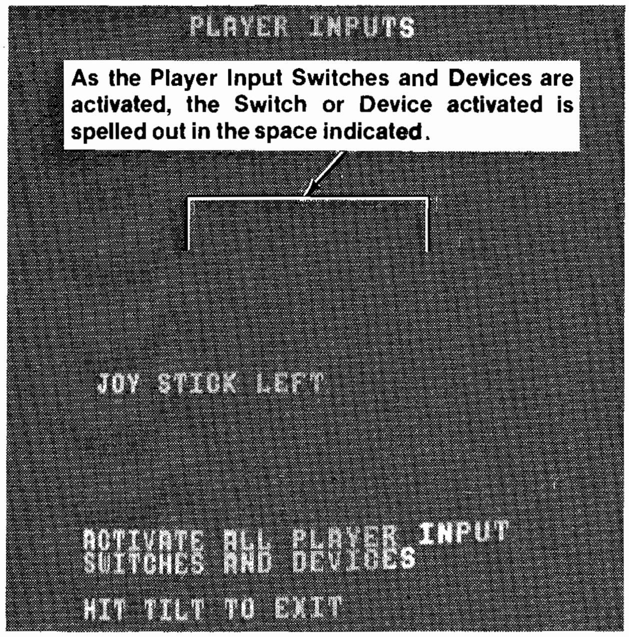


Figure 3-3 Self-Test — Player Inputs

☐ In this category, each of the game's player operated controls — including the coin switches on the back side of the coin door — may be checked individually. A game sound will be heard as each switch/control is actuated. If no game sound is heard, that switch/control is either not working, miswired, or disconnected. Check it out thoroughly.

During the BOOKKEEPING section of the Self-Test mode, the game will give a display which looks like that shown in Figure 3-4.

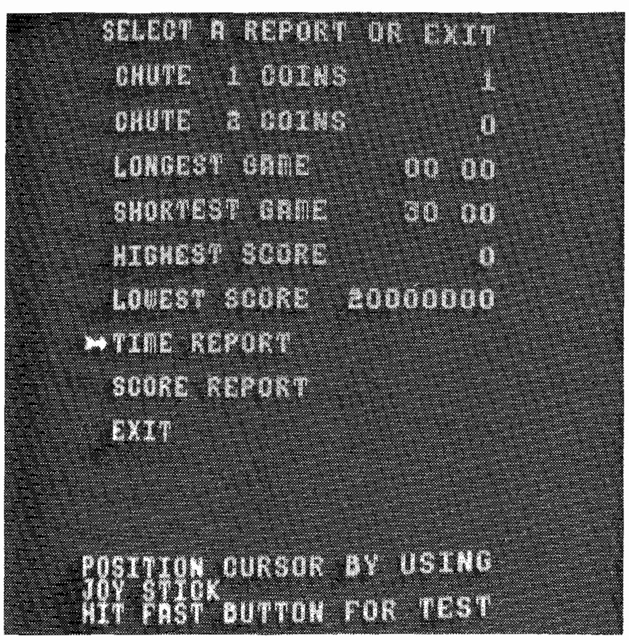


Figure 3-4 Self-Test — Bookkeeping

☐ In this category a basic bookkeeping function is performed. And with the selection of the "TIME REPORT" and the "SCORE REPORT", detailed breakdowns of game times and scores may be obtained.

In the TIME REPORT and SCORE REPORT sections of the BOOKKEEPING mode, the game will give displays which look like those shown in Figure 3-5 and 3-6 respectively.

NOTE: In the SCORE REPORT section, the "LT" means "LESS THAN" and the "GT" means "GREATER THAN".

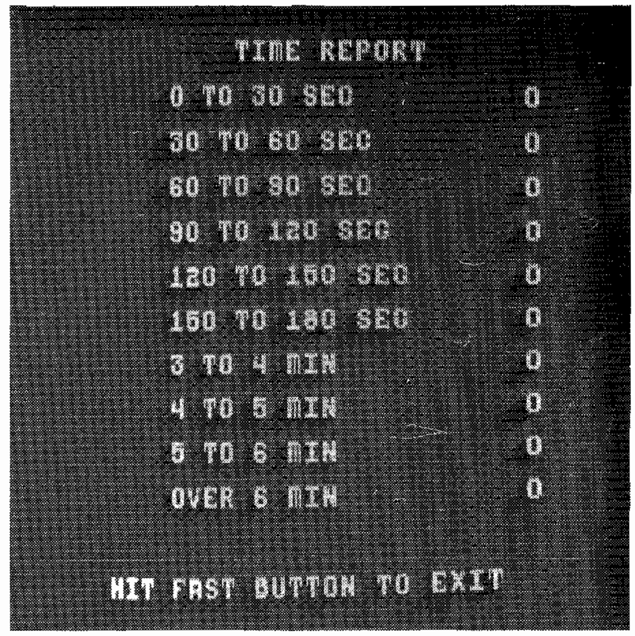


Figure 3-5 Self-Test — Time Report

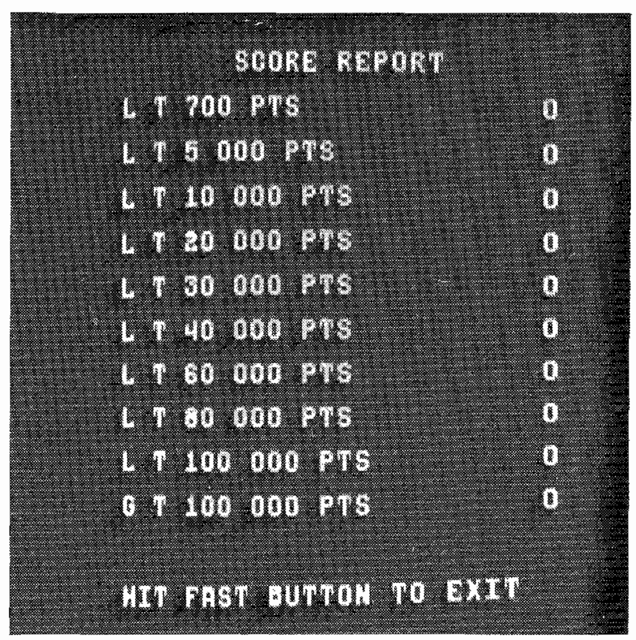
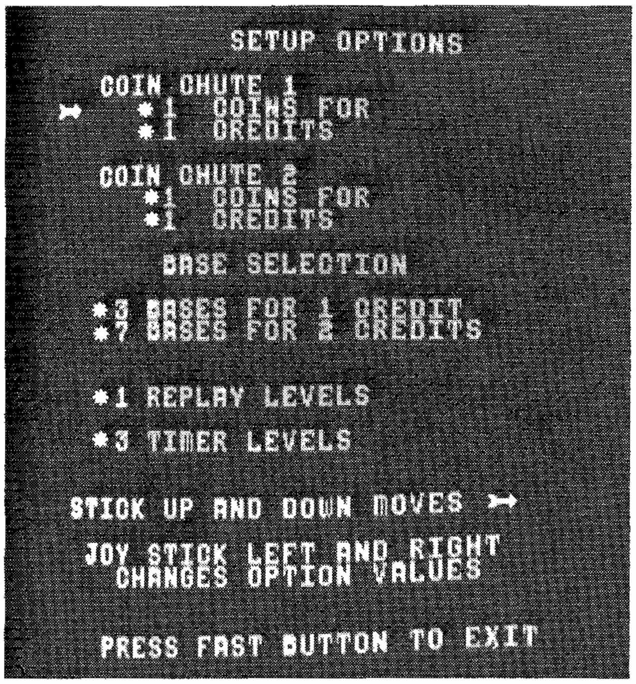


Figure 3-6 Self-Test — Score Report

During the SETUP OPTIONS section of the Self-Test mode, the game will give a display which looks like that shown in Figure 3-7.



*** = Factory recommended settings.**

Figure 3-7 Self-Test — Set Up Options

☐ In this category, all common game options may be changed from the control console: coins per credit, credits per base, bonus base(s) awarded at, difficulty level —, and so on.

DIFFICULTY LEVEL EXPLANATION:

The difficulty level of the game is controlled by the "TIMER LEVELS" setting in the SETUP OPTIONS section of the game. The easiest level of play is represented by "1" and the most difficult level of play is represented by "9". An average setting of "3" is recommended.

AWARD OF BONUS BASES EXPLANATION:

Bonus Bases are awarded in two ways: 1) After having survived a certain number of racks (see OPTION SWITCH SETTINGS TABLE), and 2) By reaching or surpassing certain point values during game play.

The point values that a player must attain during a game to receive additional ships is controlled by the "REPLAY LEVELS" setting in the above table. Following is a chart which spells out exactly at what point values additional Ships will be awarded for each graduation in the "REPLAY LEVELS" setting.

During the CHANNEL TEST section of the Self-Test mode, the game will give a display which looks like that shown in Figure 3-8.

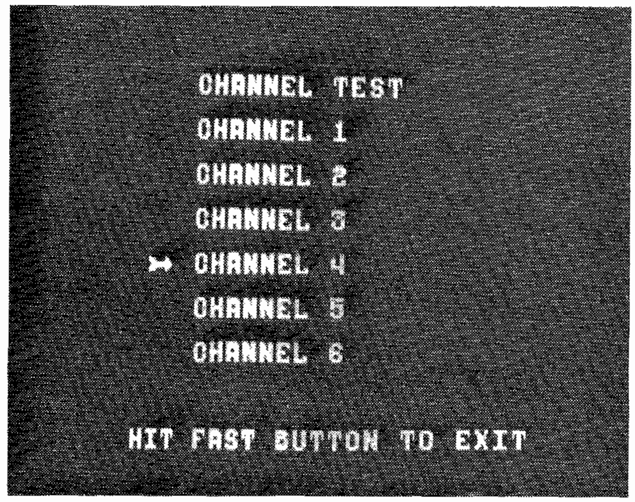


Figure 3-8 Self-Test — Channel Test

☐ In this category, the game conducts a test of its SOUND SYSTEM.

Once you enter the CHANNEL TEST section of the Self-Test mode, the game automatically tests Channels 1 through 6 giving a tone for each one as it checks it. After the 6th Channel is tested, the game automatically repeats the test until the SPEED CONTROL Button is hit. It then goes back to the Self-Test Mode Menue.

During the PRESET section of the Self-Test mode, the game will give a display which looks like the following:

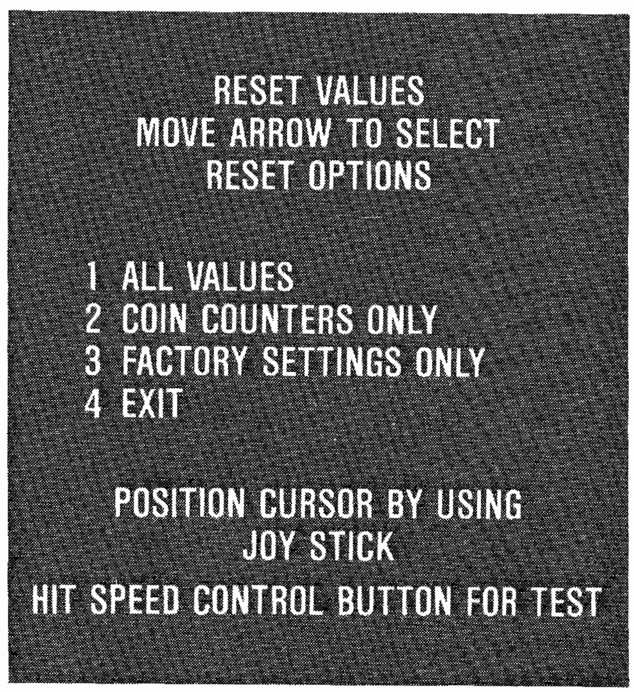


Figure 3-9 Location of Hardware Master Reset Switches

During the GRID DISPLAY section of the Self-Test mode, the game shows a white cross hatch pattern on the monitor screen. This is for alignment and/or test purposes. This pattern will remain on the monitor screen until the SPEED CONTROL Button is hit. The game will then go back to the Self-Test Mode Menue.

To leave the Self-Test mode, simply slide the Self-Test switch to the "OFF" position at **ANY** time. The game will then run through the ROM/RAM test display after which normal game functions will return to the monitor screen.

CROSS HATCH PATTERN:

A cross hatch pattern is shown on the screen when power is first turned on to the game, when the TILT Switch is actuated, during the "SELF-DIAGNOSTIC" portion of the Self-Test mode, and during the "GRID DISPLAY" portion of the Self-Test mode.

This pattern may be kept on the screen for adjustment purposes as described earlier.

When you are finished using the cross hatch pattern, simply hit the SPEED CONTROL Button to return to the Self-Test Mode Menue.

HARDWARE MASTER RESET SWITCH:

There are two of these little red switches, one on the Sound I/O Board and one on the CPU Board, located as shown in Figure 3-10.

The function of each of these switches — when pressed — is to make the game **THINK** it has **JUST** been turned on. They set up an "initial power-up" condition.

We **DO NOT** recommend that you indiscriminately press **EITHER** of these switches. They should **ONLY** be used if there is a major problem encountered while testing the P.C. Boards.

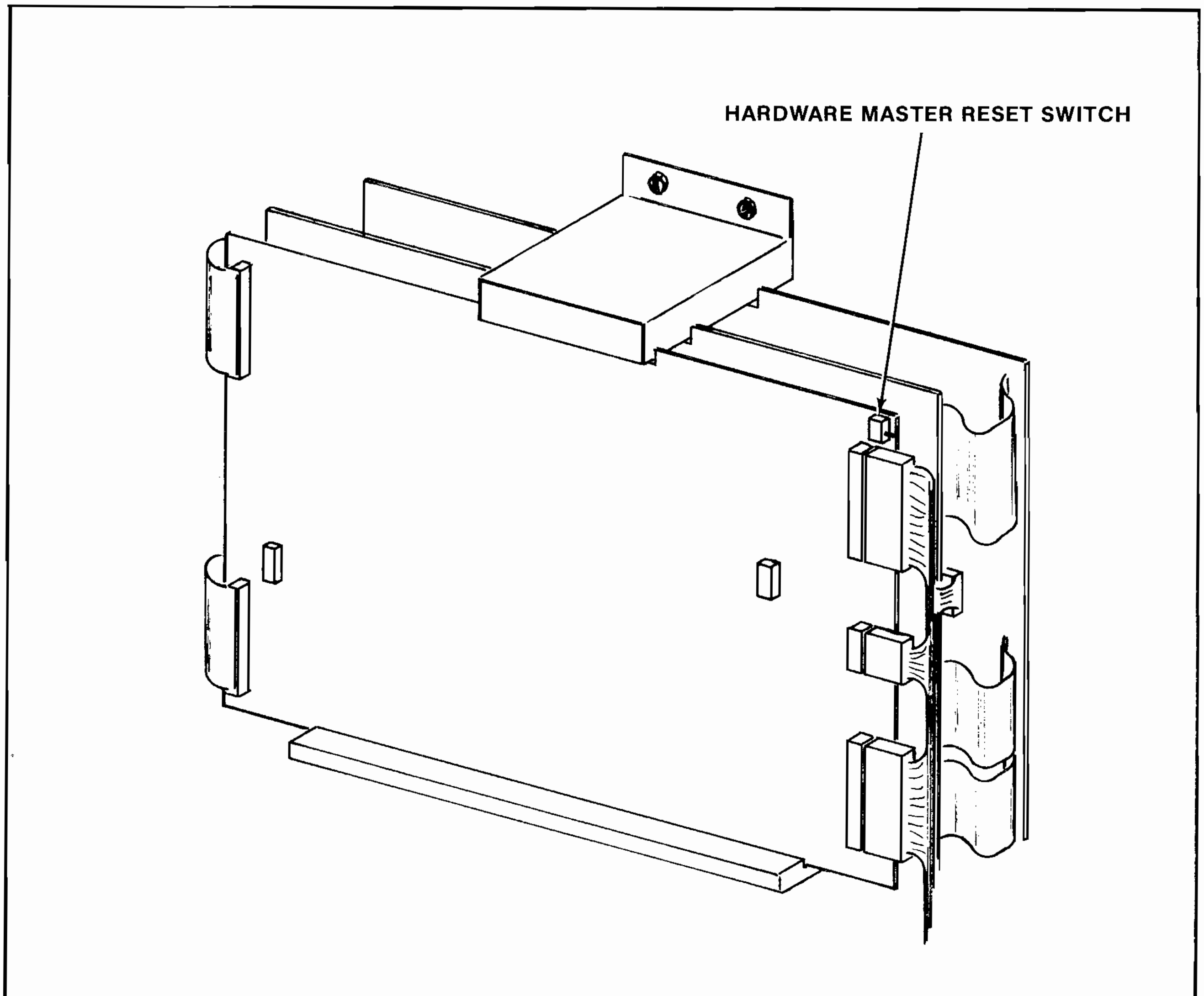
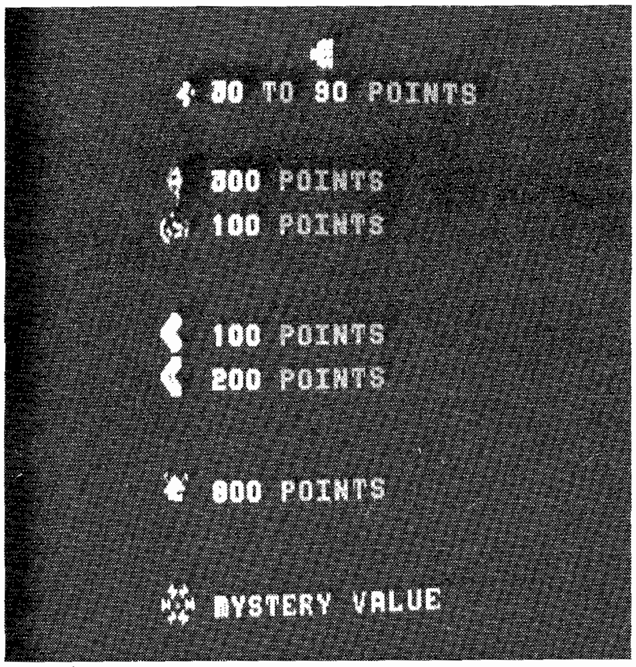


Figure 3-10 Location of Hardware Master Reset Switches

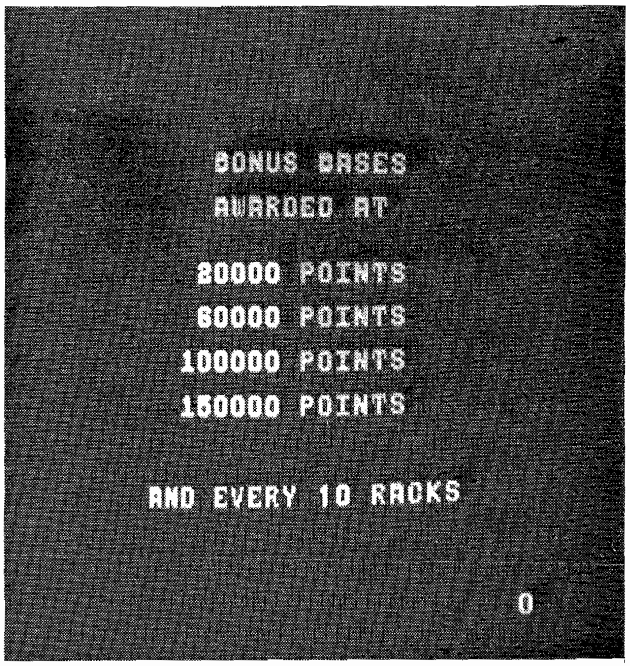
ATTRACT MODE

1. The Attract mode starts:

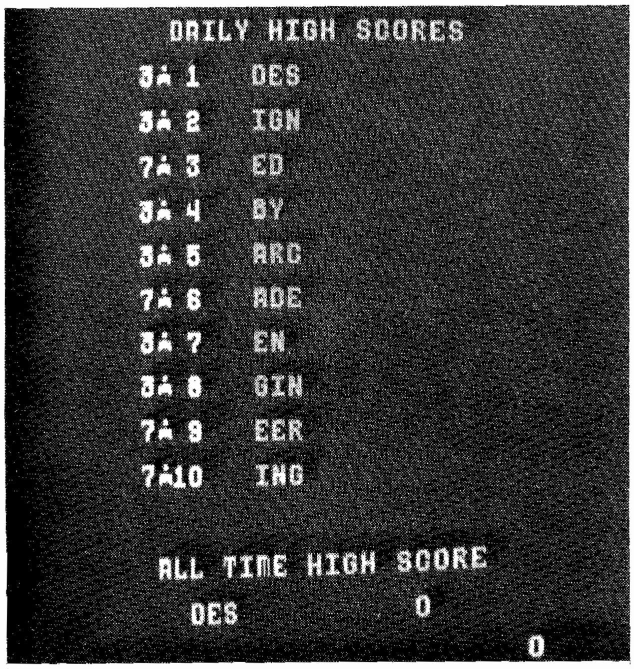
- ☐ Just after power has been turned on to the game. (Self-Test switch is in the "OFF" position.)
- ☐ After a Self-Test has been completed and there are no more credits left in the game's memory.
- ☐ After a play has finished, the score was not high enough to put the game into the High Score/Initial mode, and there are no more credits left in the game's memory.
- ☐ After the High Score/Initial mode when there are no more credits left in its memory.
- ☐ In the Attract mode, the game will give the following displays **centered** on the monitor screen:



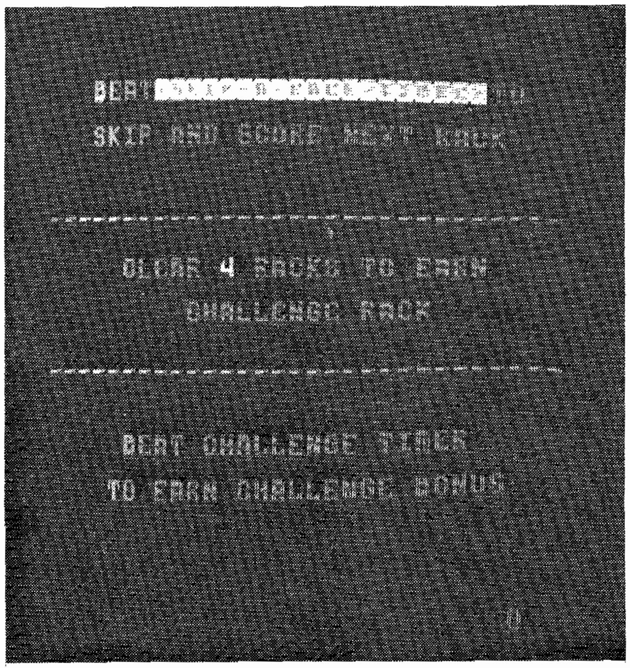
Attract Mode Display 1



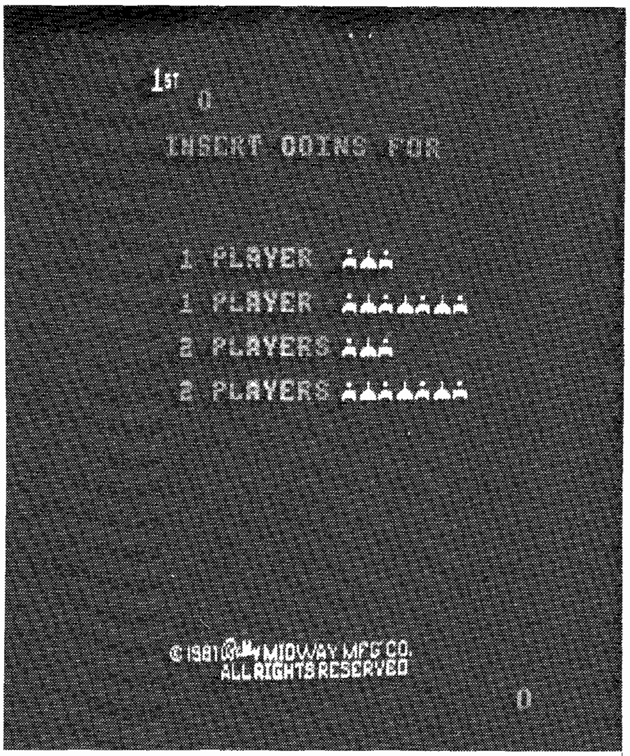
Attract Mode Display 2



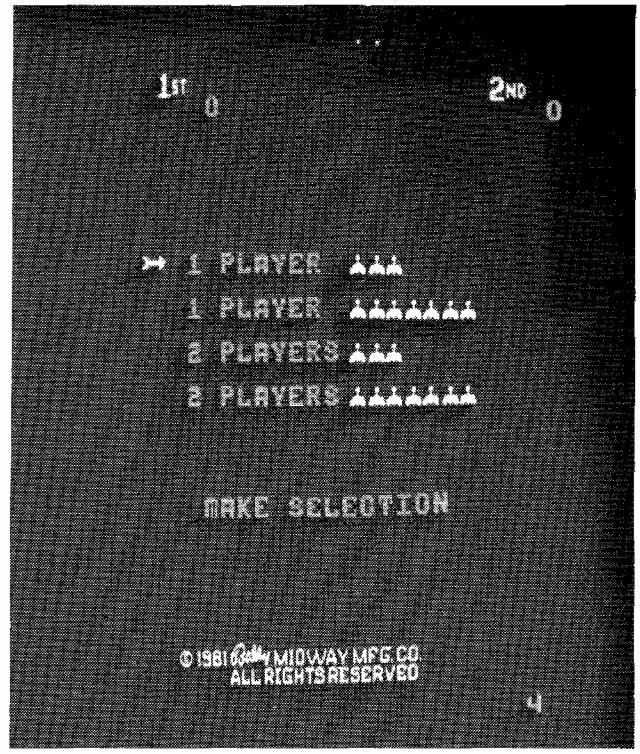
Attract Mode Display 3



Attract Mode Display 4

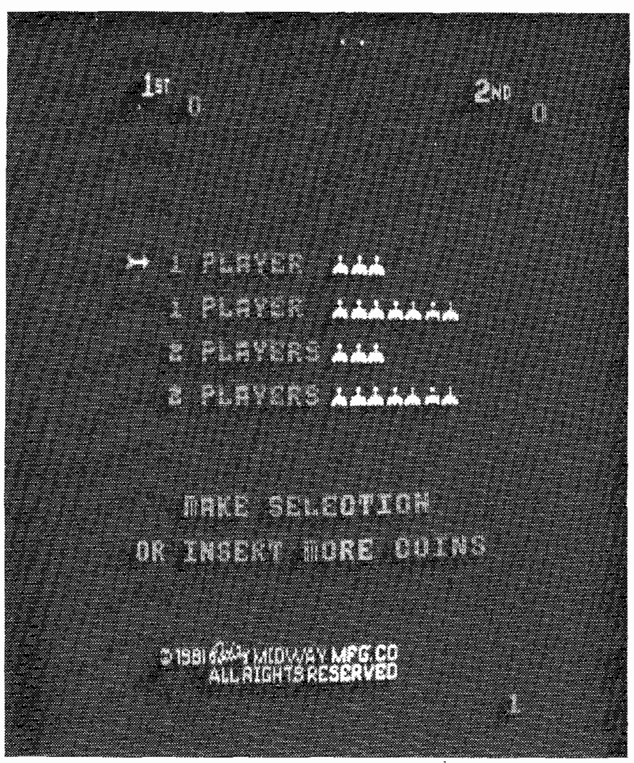


Attract Mode Display 5



Ready to Play Mode Display 2

☐ No matter where the game is in the Attract mode sequence, it will immediately go to the following display as soon as a game has been paid for.



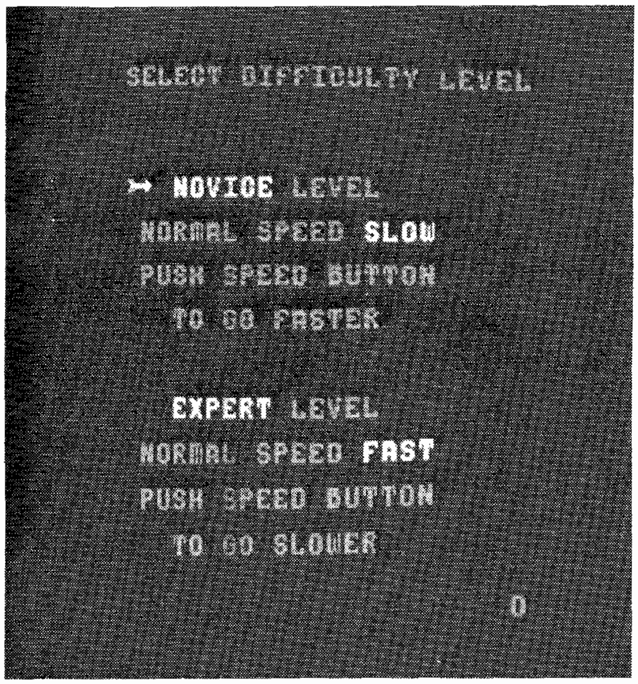
Ready to Play Mode Display 1

READY-TO-PLAY MODE

1. The Ready-To-Play mode starts when enough coins have been accepted for a 1 or a 2 player game. It will hold this display on the monitor screen until a "1 PLAYER" or a "2 PLAYER" game has been selected **BY MOVING THE CONTROL STICK FORWARD OR BACKWARD** and the SPEED CONTROL Button pushed to begin the game — or — for about 60 seconds, whichever comes first. If no game selection is made before the 60 second time limit is up, a game will begin for the number of players the cursor was pointing at when the time limit expired.
2. The Ready-To-Play mode ends when either a "1 PLAYER" or a "2 PLAYER" game has been selected and the SPEED CONTROL Button pushed to begin play.
3. In the Ready-To-Play mode, the game will give the above display **centered** on the monitor screen.
4. If the SPEED CONTROL Button is not pressed, a game will automatically begin as stated above when the 60 second time limit runs out.

PLAY MODE

1. The Play mode begins when the SPEED CONTROL Button is pressed. When this happens, the following is displayed **centered** on the monitor screen (NOVICE or EXPERT).



Play Mode Display

2. The Play mode ends when your last Ship has been destroyed. When this happens, "GAME OVER" "PLAYER 1" is displayed **centered** on the monitor screen.

3. **ON THE SCREEN:** The game is made up of 20 racks of 20 different patterns and 12 Challenging racks of 12 different patterns.

   In the regular racks, the items on the screen are as follows: 4 Thrustors — one patrolling each edge — top, bottom, left, and right; your Space Ship; the pattern which is made up of Fuzors; and some stationary Energy Fields. (These vary in number according to the difficulty of the Fuzor pattern. The more difficult the pattern, the more stationary Energy Fields that will be mixed in with it. Some patterns have NO stationary Energy Fields at all.)

   At the beginning of each rack, the game tells which player is up and what each Fuzor's point value is. When play starts, the Fuzor point value message disappears.

   The Skiprack Timer is also set at the beginning of each rack.

   Also indicated in each rack is the rack number you're playing, the number of credits on the game, the number of players (1 or 2), and a running total of the player's score(s).

4. **PLAY BEGINS:** Your ship begins to move across the screen when play begins. At the same time: the Skiprack Timer begins counting and the four Thrustors begin patrolling their edges of the screen and shooting Vortices at you. Each thrustor has the capability of shooting two successive Vortices at you. So you could have a total of 8 moving Vortices to dodge at one time, coming at you from all different directions. The longer you are in any particular rack, the faster the Thrustors will fire at you.

5. **PULZORS:** At some time during each rack, a Pulzor will appear at a random location on the screen for a **short** period of time. If you run it over with your Ship, you will be awarded the bonus points for this Pulzor. If it should disappear **BEFORE** you have the opportunity to run it over and/or shoot it, it **WILL** reappear again **DURING** this particular rack.

   The Pulzor's bonus point value will vary between 200 and 800 points. Their bonus point value is displayed on the screen at the time they are run over or shot.

6. **FREEZOR:** At some point near the beginning of each rack, a Freezor will appear at one edge of the screen and begin to **ERRATICALLY** work its way to one of the other edges. If you can run over or shoot the Freezor **BEFORE** it reaches the other edge of the screen, it will cause **ALL FOUR (4)** of the Thrustors to freeze in their tracks the instant you hit or run over the Freezor. The Thrustors will remain frozen in place for about 6 seconds. While in this condition, they cannot shoot Vortices at you or move in any other way at all.

7. **SKIPRACK TIMER:** The Skiprack Timer is set at the beginning of each rack. The more difficult the pattern of Fuzors that you have to eliminate, the longer the amount of time it will take the Skiprack Timer to count out.

   The object of the game is to completely eliminate the pattern of Fuzors from the screen before the Skiprack Timer reaches zero — "0". Try to do this without loosing a Ship. However, if you should lose a Ship, this **WILL NOT** cancel the Skiprack Timer feature. When your new Ship appears, just pick up where you left off and try to eliminate the rest of the pattern of Fuzors **BEFORE** the Skiprack Timer counts out.

   If the Skiprack Timer counts out **BEFORE** you are able to eliminate the entire pattern of Fuzors, just continue playing and go on to the **NEXT** rack after you've eliminated the last fuzor in this one. You can then try to beat the Skiprack Timer in that next rack.

   When you do beat the Skiprack Timer (eliminate all the Fuzors **BEFORE** it counts out), you are awarded 100 bonus points for every unused division still remaining on the Skiprack Timer, i.e. 5

unused divisions left on the Skiprack Timer, 500 bonus points are added to your score. Plus, you get all the points for each Fuzor and the Pulzor that are in the next rack. The game then skips that rack and goes to the one after it for your next rack of play.

If you beat the Skiprack Timer in that rack, the above events repeat themselves. If you do not beat the Skiprack Timer in that rack, just continue playing and you will advance to the next rack in line when your last Fuzor is eliminated in your present rack.

8. **SPEED CONTROL BUTTON:** The SPEED CONTROL Button is used to **DOUBLE** the speed at which your Ship travels on the screen when you are in the **NOVICE** mode of game play and to halve the speed at which your ship travels on the screen when you are in the **EXPERT** mode of game play. You **WILL NOT** be able to beat the Skiprack Timer unless you learn to control your Ship at the higher speeds.

9. **THRUSTORS:** These are interesting little fellows with a few surprises up their sleeves. They patrol the top, bottom, left, and right sides of the monitor screen shooting Vortices at you all the while. They can, however, be disabled for about 6 seconds at a time if you know how.

   Here's how. (You also get bonus points each time you disable a Thrustor.) For short periods of time during each rack, each Thrustor will turn yellow in color. When a Thrustor is yellow, it can be run over or shot by your Ship. When you do this, that Thrustor will remain stationary at the point where you hit or ran over it for approximately 6 seconds. During this time it will also stop shooting Vortices at you. If your ship touches a Thrustor when it is any color but yellow, your Ship will be destroyed.

   All four Thrustors may be disabled at the **SAME TIME** if you shoot or run over the Freezor as it works its way across the screen. All four Thrustors are also disabled for a short period of time if you shoot **ANY** single red Thrustor. However, they can still shoot Vortices at you, so **BE CAREFUL!**

   It is recommended that you **ONLY** approach a yellow Thrustor from the side to run it over. This is because they can still shoot Vortices while they are yellow — until you run them over. So, if you approach a yellow Thrustor from the front to run it over, the chances are very good to excellent that it will pop a Vortex right down your throat (very undesirable). Therefore, approach from the side. A Thrustor **CANNOT** shoot Vortices to the side — **ONLY** from its front.

   Thrustors can only shoot two Vortices each and cannot shoot again until one of the previously shot Vortices either disappears from the screen or goes off it at one edge. As you spend more time in any particular rack, or, as you advance into the more difficult racks, the Thrustors will pick up the pace at which they shoot at you.

10. **VORTICES:** There is only one type of Vortex in the game: that which is shot at you by the Thrustors. The moving Vortices are shot out by the Thrustors. As a general rule here, the easier the Fuzor pattern, the shorter the distance these moving Vortices will travel before they fade away and the slower will be the speed at which they travel this distance.

    In the higher racks, the moving Vortices travel at high speed and go all the way across the screen no matter which direction they were shot from.

    If your Ship runs into any Vortex, it will be destroyed.

11. **STATIONARY ENERGY FIELDS:** There is only one type of Energy Field in the game: that which is stationary. If your Ship should run into an Energy Field, it will be held and spun around several times before it is set free. This gives the Thrustors a chance to line up on you.

    The stationary Energy Fields are not present in all Fuzor patterns. As a general rule, the more difficult the pattern of Fuzors is, the higher the number of stationary Energy Fields that will be mixed in with it.

12. **BONUS SHIPS:** Bonus Ships are awarded in two different ways in the game: 1) When the player reaches or passes certain operator selected point values (see the "MACHINE SETUP" section of this manual for the individual point values at which each bonus Ship can be awarded), and 2) When the player reaches or passes a certain operator selected number of racks (see the "OPTION SWITCH SETTINGS TABLE").

13. **FUZORS:** Their point value increases as the rack numbers advance. The point value of the Fuzors is displayed at the top of the monitor screen **BEFORE** each rack begins. Example: for racks 1, 2 and 3, the Fuzors are worth 30 points each; for racks 4 and 5 the Fuzors are worth 40 points each; and so on.

    As you get into the higher racks, the Fuzors have to be run over twice before they are eliminated. You are awarded their **FULL** value for **EACH** time you run them over. The way you can tell when you are in a rack where the Fuzors have to be run over twice before they are eliminated is that when you run over them once, their pattern changes drastically from those that have not been run over at all.

    If you decide to shoot some of the Fuzors (instead of running over them twice) they will be completely eliminated with **ONLY ONE SHOT** and you are awarded their entire point value times two.

14. **CHALLENGING RACKS:** Every 4th rack is a Challenge Rack. There are **ONLY** Fuzors in a Challenge Rack. The Skiprack Timer is active in each Challenge Rack. It is used here as a countdown timer. You have a very short period of time to eliminate the pattern of Fuzors that makes up each Challenge Rack. You collect points for each Fuzor eliminated. If you eliminate the entire pattern of Fuzors **BEFORE** the timer runs out, you are awarded bonus points. You get 1,000 bonus points for completing the 1st Challenge Rack. This total increases by 600 points for each succeeding Challenge Rack until you get to the 12th one at 7,600 bonus points. The 12th Challenge Rack then repeats after every 3rd regular rack.

    It should be noted that **ONLY** Challenge Rack number 1 will come up after every 3rd rack until you beat the timer. Then, **ONLY** Challenge Rack number 2 will come up after every 3rd rack until you beat the timer for this pattern, and so on.

    When in any Challenge Rack, if you don't beat the timer, all Challenge Rack action stops when the timer counts out and the next regular game rack is displayed on the screen. You retain all points for any Fuzors you eliminated up to the moment the timer counted out.

15. **PLAY ENDS:** When your last Ship is destroyed, "GAME OVER" "PLAYER 1" is displayed centered on the monitor screen.

16. **HIGH SCORE/INITIAL MODE:** If your score was high enough to become one of the ten best scores, the game will go into the High Score/Initial mode immediately after the above display. If your score was not high enough to cause the game to go into the High Score/Initial mode, it will either go to the Attract mode (if there are no more credits left in its memory) or into the Ready-To-Play mode (if there are still credits left in its memory). In the High Score/Initial mode the game gives a display which looks like that shown in Figure 3-11.

    By pulling the control stick toward you, you can make the cursor move down the alphabet: "A", "B", "C", "D", etc. By pushing the control stick away from you, you can make the cursor move up the alphabet: "Z", "Y", "X", "W", etc.

    When you reach your initial, release the control stick and push the SPEED CONTROL Button. Your initial is printed out below the on-screen instructions. If you do not wish to put your initials opposite your score, just press the SPEED CONTROL Button three times. Three "A" 's will appear below the on-screen instructions.

    NOTE: If you make a mistake, you can erase the wrong letter by positioning the cursor opposite the "ERASE" word at the bottom of the line of



Figure 3-11 High Score/Initial Mode

alphabet characters and pressing the SPEED CONTROL Button. Then simply go back and print out the correct letter.

When you've printed out your last initial, move the cursor opposite the "END" word and press the SPEED CONTROL Button to tell the game you are through printing out your initials. The game will then give the following RANKINGS display showing your score opposite your ranking and your initials. See Figure 3-12.

Number of Space Ships used to achieve your score is indicated in this column.

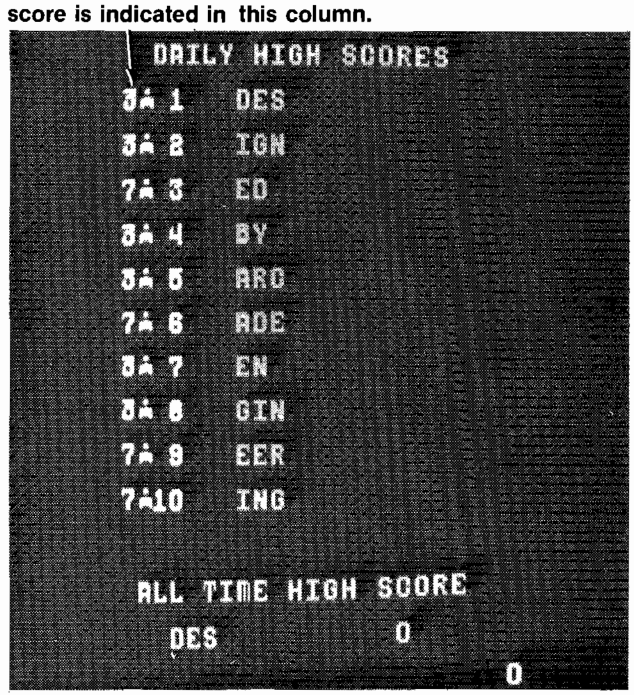


Figure 3-12 Rankings Display

NOTE: If you don't tell the game you are through printing out your initials as instructed above, the game will automatically go into the RANKINGS display after a short wait.

After the High Score/Initial mode, the game will either go to the Attract mode (if there are no more credits left in its memory) or into the Ready-To-Play mode (if there are still credits left in its memory).

17. Most of the above holds true in the "2 PLAYER" mode also. But there are a few minor differences.

TWO PLAYER OPERATION

The Upright, Mini, and Cocktail Table models all have two player operation.

In the two player mode, the rules of play are the same as in the single player mode. There are some additional rules, however.

1. In the Upright and Mini models, the players must take turns at the controls.
2. In the Cocktail Table model, each player has his own set of individual controls. The picture will flip to face you when it is your turn. (When it is not your turn, your set of controls will have **NO** effect on the game.)
3. Your turn lasts until your Ship is destroyed. At this point, the game will do one of several things depending on whether or not the destroyed Ship was your last or if you still have others remaining in reserve.

DESTROYED SHIP — OTHERS REMAINING IN RESERVE

☐ The game stops and "PLAYER ___ UP" is displayed on the screen.

☐ Next, the other player's Ship and Fuzor pattern appear on the monitor screen and game play begins for the other player.

DESTROYED SHIP — NO OTHERS REMAINING IN RESERVE

☐ Game displays: "GAME OVER" "PLAYER ___" on the monitor screen.

☐ After the above display, if your score was high enough, it goes to the "HIGH SCORE/INITIAL" mode.

After this mode, "PLAYER ___ UP", the other player's Ship, and Fuzor pattern appear on the monitor screen. Play then begins for the other player.

If your score was **NOT** high enough to cause the game to go into the "HIGH SCORE/INITIAL" mode, the game will just display "PLAYER ___ UP", the other player's Ship, and Fuzor pattern on the monitor screen. Play then begins for the other player.

IV. Maintenance and Repair

Your **NEW** game needs certain types of maintenance to keep it in good working order. **CLEAN,** well **MAINTAINED** games **attract players** and **EARN MORE PROFITS.**

The most important thing for you to remember is to run the Self-Test EVERY TIME you collect money from the coin box. **JUST LOOKING** at your game **WILL NOT** tell you if all its controls and inside parts are working correctly. The Self-Test will inform you whether or not your game is working the way it should.

The second most important thing you should remember is to clean the outside of the game and coin acceptor mechanisms on a regular basis.

CLEANING

The outside of the game cabinet plus the metal can be cleaned with any non-abrasive household cleaner. However, the front of the T.V. monitor tube and **both sides** of all other glass and plastic on or in the game MUST be cleaned with anti-static cleaner **ONLY.** For cleaning the coin acceptors: hot soapy water may be used on the plastic ones and any household cleanser may be used on the metal ones. If you wish, special coin machine cleaners that leave no residue may be purchased from your distributor.

DO NOT dry-wipe any of the plastic panels. This is because any dust that was on them can scratch their surfaces. If this has happened, anyone looking through this type of damaged plastic would feel he was looking at the game through a fog. This fogging damage CANNOT be repaired or reversed. The ONLY solution is to **replace** the damaged piece of plastic.

FUSE REPLACEMENT

This game contains several fuses located as shown in Figure 4-1.

1. **UPRIGHT MODEL:**

   As viewed from the back, facing the cabinet, with the rear access door removed; the fuses are located on the Mech. Panel and the Power Supply Board.

2. **MINI MODEL:**

   As viewed from the back, facing the cabinet, with the rear access door removed; the fuses are located on the Mech. Panel and the Power Supply Board.

3. **COCKTAIL TABLE MODEL:**

   As viewed from the coin door side of the cabinet, with the monitor tilted open to one side; the fuses are located on the Mech. Panel and the Power Supply Board.

Replace fuses **ONLY** with the type and size listed in the Illustrated Parts Breakdown Section of this manual.

See the T.V. Monitor Manual (available on request from your distributor or the monitor manufacturer) and/or the T.V. Troubleshooting Section of this manual for information on these fuses.

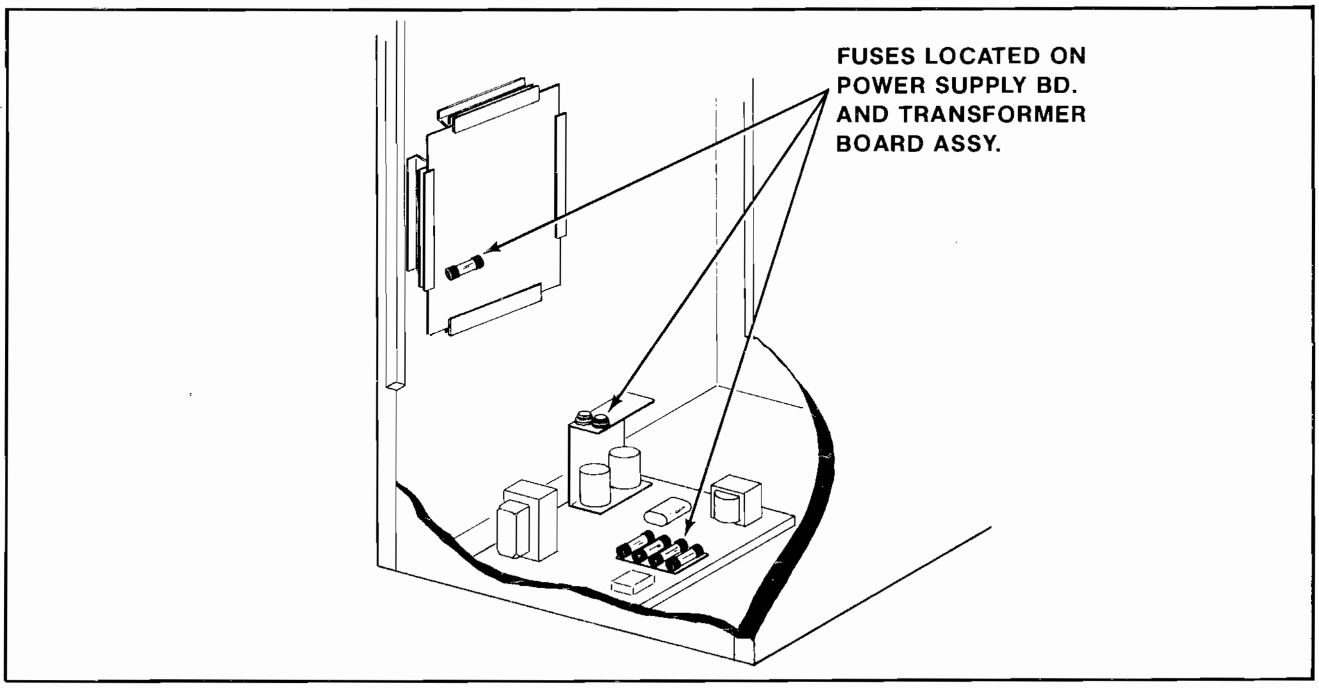


Figure 4-1 Location of Fuses

OPENING THE CONTROL PANEL

1. **UPRIGHT MODEL:** See Figure 4-2.

- ☐ The control panel is held in place by two latches, one on the left side and one on the right side of the cabinet.

  They are spring loaded to provide constant positive pressure on their latch plates.

  They can be reached through the coin door **AFTER turning power to the game off.**

  To release the latches, lift up and toward the front center of the control panel.

  Once they are released, unhook them from their latch plates.

- ☐ To remove the control panel:

  Raise it up and tilt it toward you until you can see the cable behind it.

  Cradling the control panel between yourself and the cabinet, disconnect it from its cabling.

  The control panel is now free and can be removed.

- ☐ To reinstall the control panel, reverse this procedure.

2. **MINI MODEL:** See Figure 4-2.

- ☐ The control panel is held in place by two latches, one on the right side, and one on the left side of the cabinet.

  They are spring loaded to provide constant positive pressure on their latch plates.

  They can be reached through the coin door **AFTER turning power to the game off.**

  To release the latches, lift up and toward the center of the control panel.

  Once they are released, unhook them from their latch plates.

- ☐ To remove the control panel:

  Raise it up and tilt it toward you until you can see the cable behind it.

  Cradling the control panel between yourself and the cabinet, disconnect it from its cabling.

  The control panel is now free and can be removed.

- ☐ To reinstall the control panel, reverse this procedure.

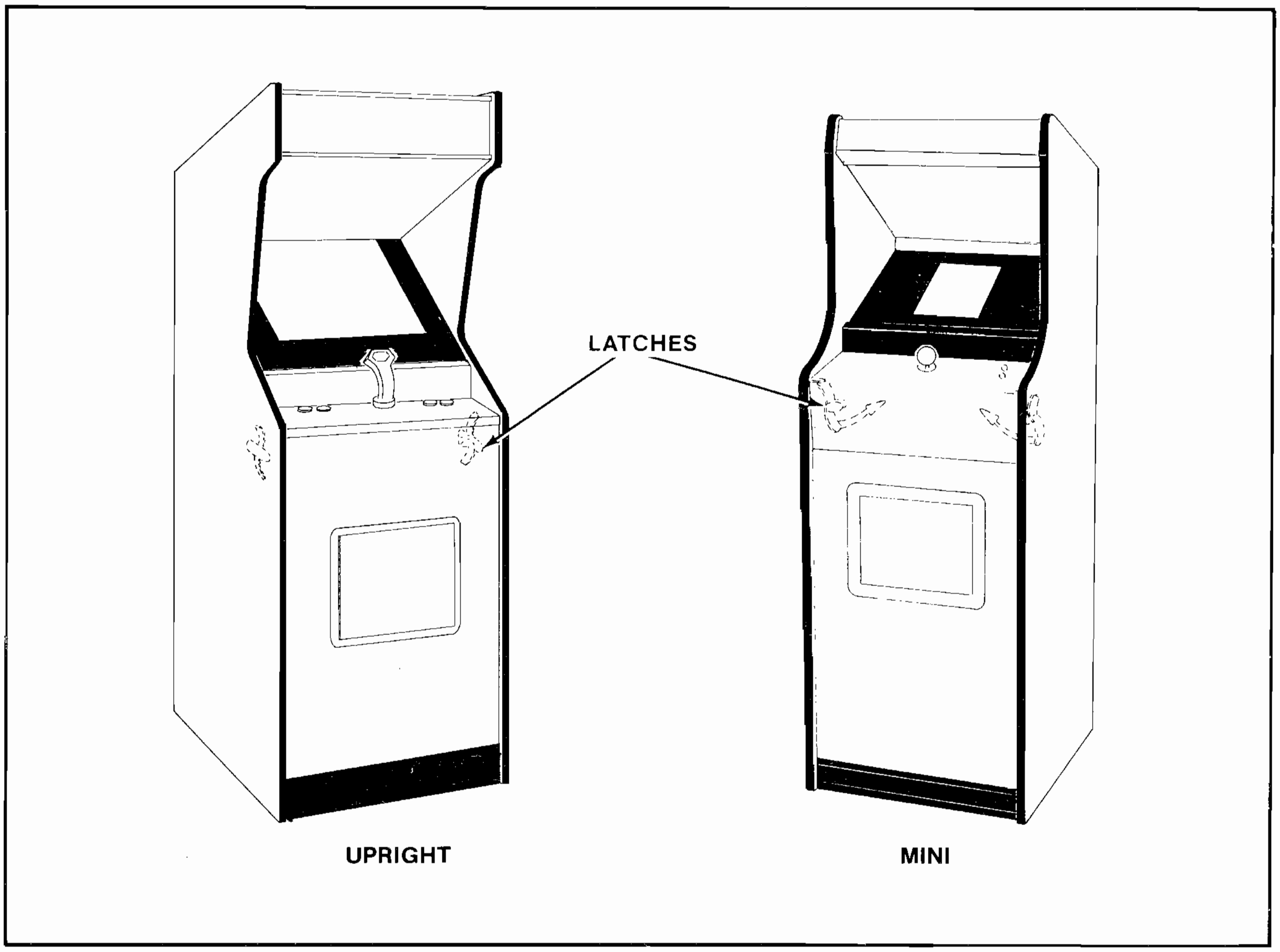


Figure 4-2 Opening the Control Panel — Upright & Mini

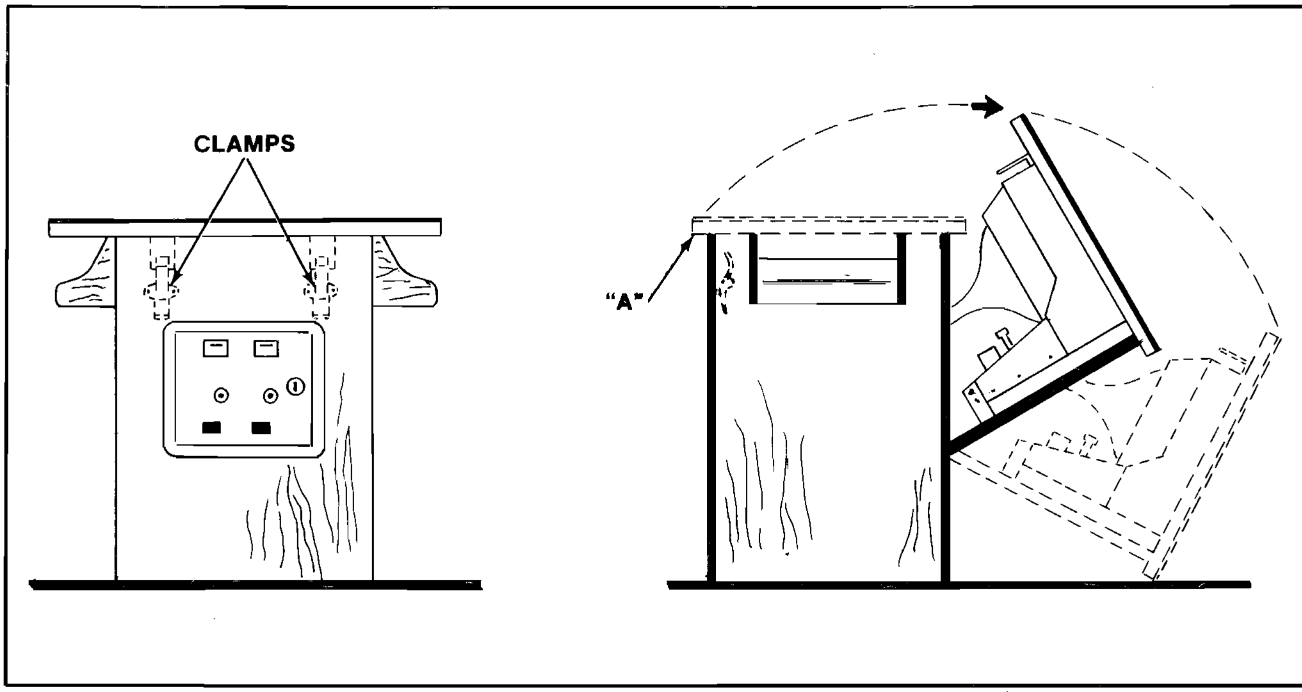


Figure 4-3 Opening the Cocktail Game

3. **COCKTAIL TABLE MODEL:**

- ☐ Each control panel is held in place by several screws, two on the inside of the cabinet and three along the outside bottom edge of the control panel.

  Turn power to the game off.

  Open the coin box door and release the two latches indicated in Figure 4-3.

CAUTION: The right hand latch is very close to the HIGH VOLTAGE on the monitor. BE CAREFUL!!

Once they're released, unhook them from their latch plates.

Grasp the table top at "A" and open it as indicated in Figure 4-3.

CAUTION: Due to the weight of the monitor, EXTREME CARE MUST be taken when opening the cabinet.

Remove the screws which secure the control panel in place. See Figure 4-4.

- ☐ To remove the control panel(s):

  Disconnect it from its cabling.

  The control panel is now free and can be removed.

- ☐ To reinstall the control panel, reverse this procedure.

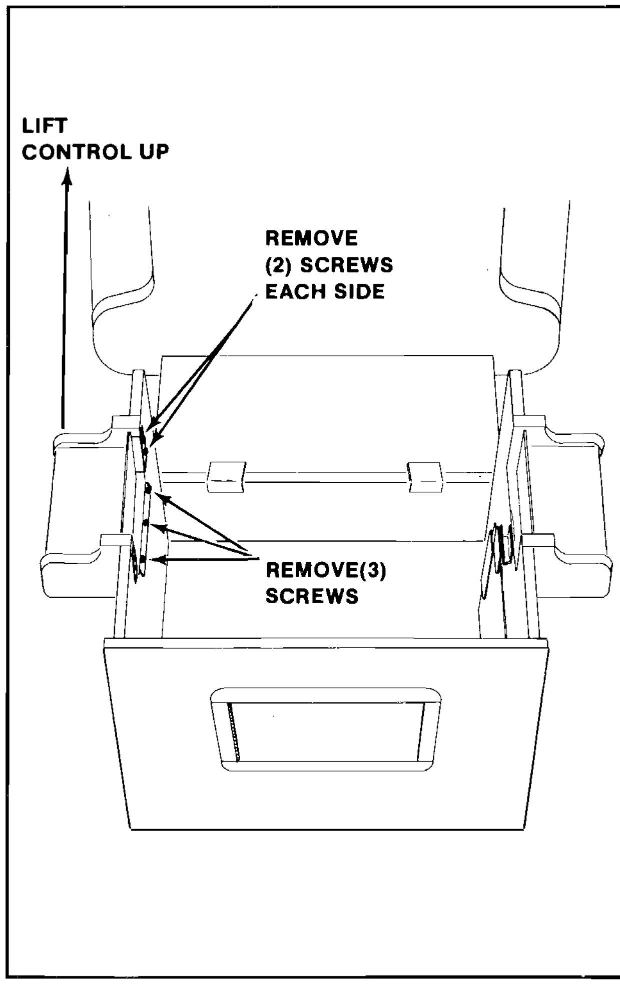


Figure 4-4 Removing the Control Panel — Cocktail

REMOVAL OF THE MAIN-DISPLAY-GLASS AND/OR THE T.V. BEZEL ASSEMBLY

1. UPRIGHT MODEL:

NOTE: In order to do this, the control panel **MUST** be removed first. See the "Upright Model" procedure.

- ☐ **Turn the power to the game off** and remove the control panel.
- ☐ Remove the screws which secure the glass clamping plate. See Figure 4-5.
- ☐ Lift out the glass clamping plate. This frees the main-display-glass so it can be lifted up.
- ☐ By putting your finger in the hole in the middle of the main-display-glass support, you can lift it up and out. See Figure 4-5.
- ☐ Loosen the screws which secure the T.V. bezel-glass-clamps in place.
  Move the clamps to the side and the bezel glass may be removed.
  Remove the above mentioned screws and the bezel with four bezel-glass-clamps may be removed.
- ☐ To reinstall the T.V. bezel assembly and the main-display-glass, reverse this procedure.

2. MINI MODEL:

NOTE: In order to do this, the control panel **MUST** be removed first. See above "Mini Model" procedure.

- ☐ **Turn the power off to the game** and remove the control panel.
- ☐ Remove the screws which secure the glass clamping plate. See Figure 4-6.
- ☐ Lift out the class clamping plate. This frees the main-display-glass so it can be lifted up.
- ☐ By putting your finger in the hole in the middle of the main-display-glass support, you can lift it up and out. See Figure 4-6.
- ☐ Remove the screws which secure the T.V. bezel assembly and lift it out. See Figure

NOTE: Use the hole in the center of the main-display-glass support to grasp it.

- ☐ Reverse this procedure to reinstall the T.V. bezel assembly and the main-display-glass.

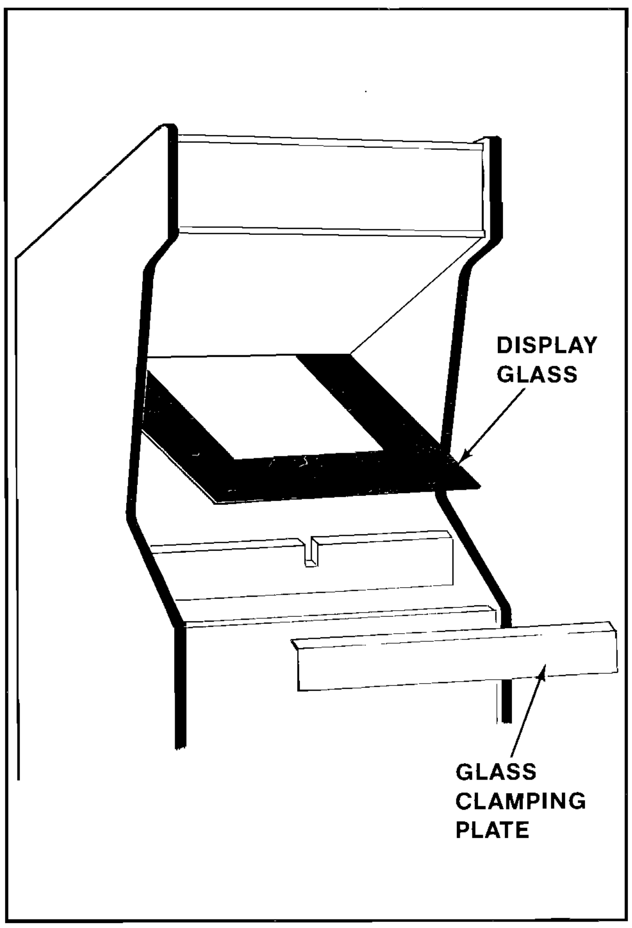


Figure 4-5 Removing the Main Display Glass & T.V. Bezel — Upright

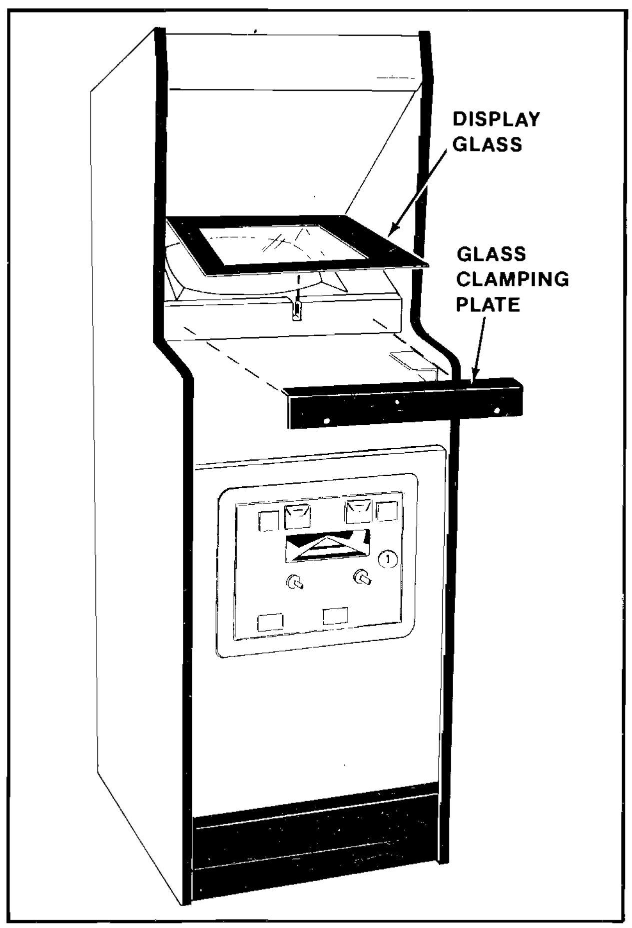


Figure 4-6 Removing the Main Display Glass & T.V. Bezel — Mini

3. **COCKTAIL TABLE MODEL:** See Figure 4-7.

NOTE: This may be done with the table top in the closed or the open position. If you decide to open the table top, **TURN THE POWER TO THE GAME OFF FIRST.**

- ☐ Remove the screws which secure the table top glass clamps in place.
- ☐ Remove the table top glass.
- ☐ Lift out the T.V. bezel assembly.
- ☐ To reinstall the T.V. bezel assembly and the table top glass, simply reverse this procedure.

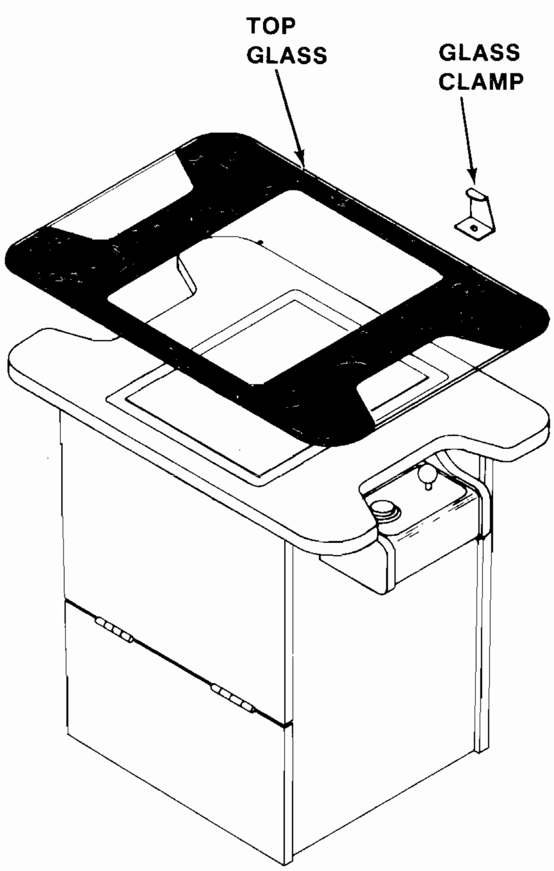


Figure 4-7 Removing the Top Glass & T.V. Bezel — Cocktail

T.V. MONITOR REPLACEMENT

CAUTION: High voltages may exist in any television unit, even with the power disconnected. Use EXTREME CAUTION and do not touch electrical parts or the T.V. yoke area with your hands or with metal objects held in your hands!

In addition, BE SURE TO USE HEAVY GLOVES when handling the monitor. You could cut your hands on the metal T.V. chassis without such protection.

DANGER: The T.V. monitor DOES NOT contain an isolation transformer on its chassis (it is mounted instead on the floor of the cabinet). When servicing the monitor on a test bench, YOU MUST ISOLATE THE MONITOR FROM AC VOLTAGE WITH AN ISOLATION TRANSFORMER.

1. **UPRIGHT MODEL:** See Figure 4-8.
   - ☐ **Turn power off to the game.**
   - ☐ Open the rear access door.
   - ☐ Completely disconnect the T.V. monitor from all its cabling. DON'T FORGET THE CHASSIS GROUND WIRE.
   - ☐ Before removing the T.V. monitor, the main-display-glass must be removed. See above "Upright Model" procedure.
   - ☐ With the removal of only four bolts, the T.V. monitor will be loose.

   CAUTION: BE SURE to support the T.V. monitor from the rear while removing the four bolts so it will not fall out of the cabinet.

   - ☐ The monitor mounting bars slide on top of and against two metal guides mounted to the cabinet's right and left sides. The monitor is removed by sliding it out the back of the cabinet. See Figure 4-8.
   - ☐ To reinstall the T.V. monitor, reverse this procedure.
   - ☐ After replacing the T.V. monitor, be sure to run the game Self-Test.
2. **MINI MODEL:**
   - ☐ **Turn the power off to the game.**
   - ☐ Open the rear access door.
   - ☐ Completely disconnect the T.V. monitor from all its cabling. DON'T FORGET THE CHASSIS GROUND WIRE.
   - ☐ Before removing the T.V. monitor, the main-display-glass and bezel must be removed. See above "Mini Model" procedure.

☐ With the removal of only four bolts, the T.V. monitor will be loose.

CAUTION: BE SURE to support the T.V. monitor from the rear while removing the four bolts so it will not fall out of the cabinet.

☐ The monitor is removed by supporting it and pulling straight back as shown in Figure 4-9. (BE CAREFUL not to hit monitor on its rear support bracket.)

☐ To reinstall the T.V. monitor, reverse this procedure.

☐ After replacing the T.V. monitor, be sure to run the game Self-Test.

3. COCKTAIL TABLE MODEL:

☐ **Turn the power off to the game.**

☐ Open the coin box door and release the two latches indicated in Figure 4-10.

CAUTION: The right hand latch is very close to the HIGH VOLTAGE on the monitor. BE CAREFUL!!

☐ Once the latches are released, unhook them from their latch plates.

☐ Grasp the table top at "A" and open it as indicated in Figure 4-10.

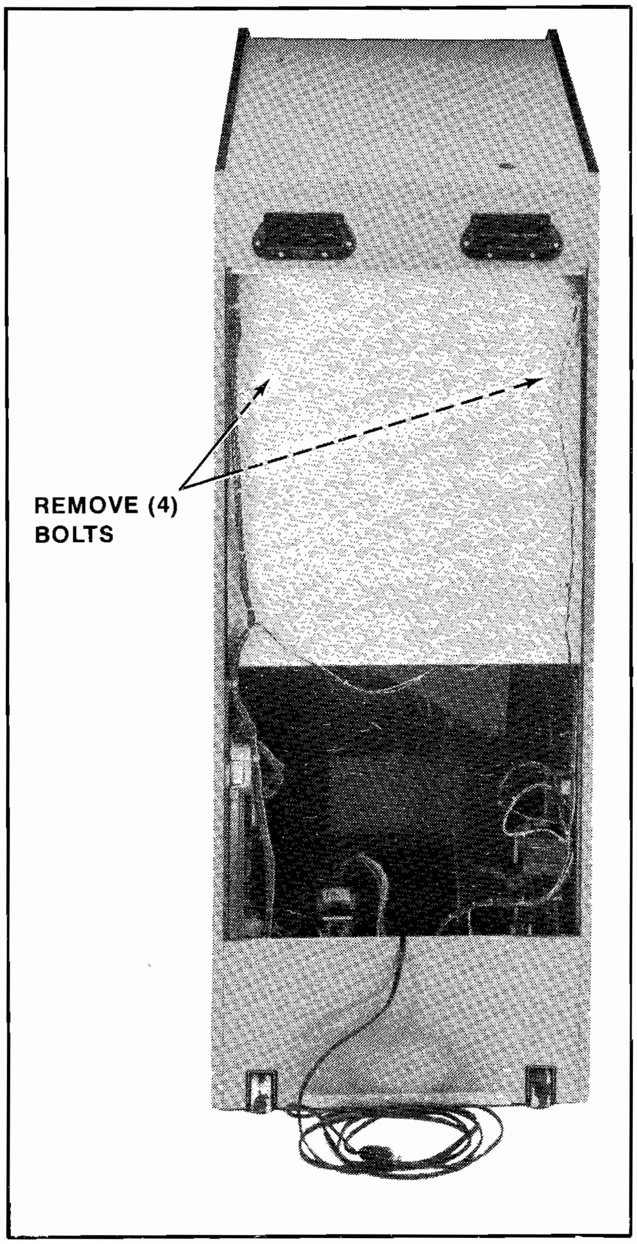


Figure 4-8 Removing the Monitor — Upright

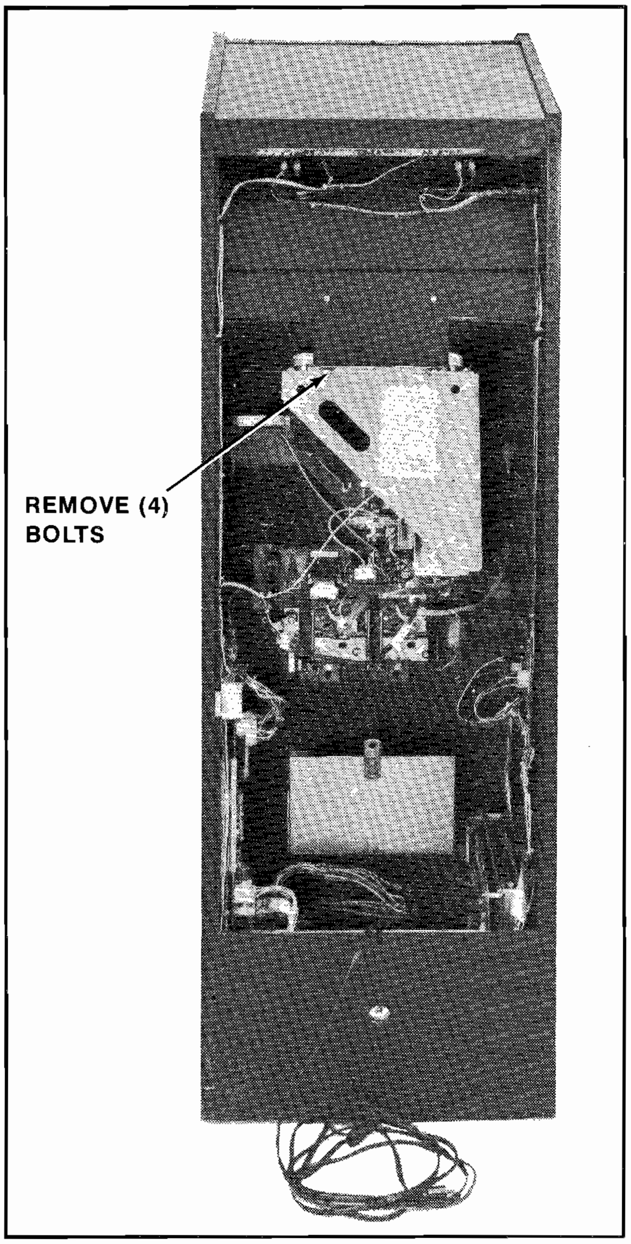


Figure 4-9 Removing the Monitor — Mini

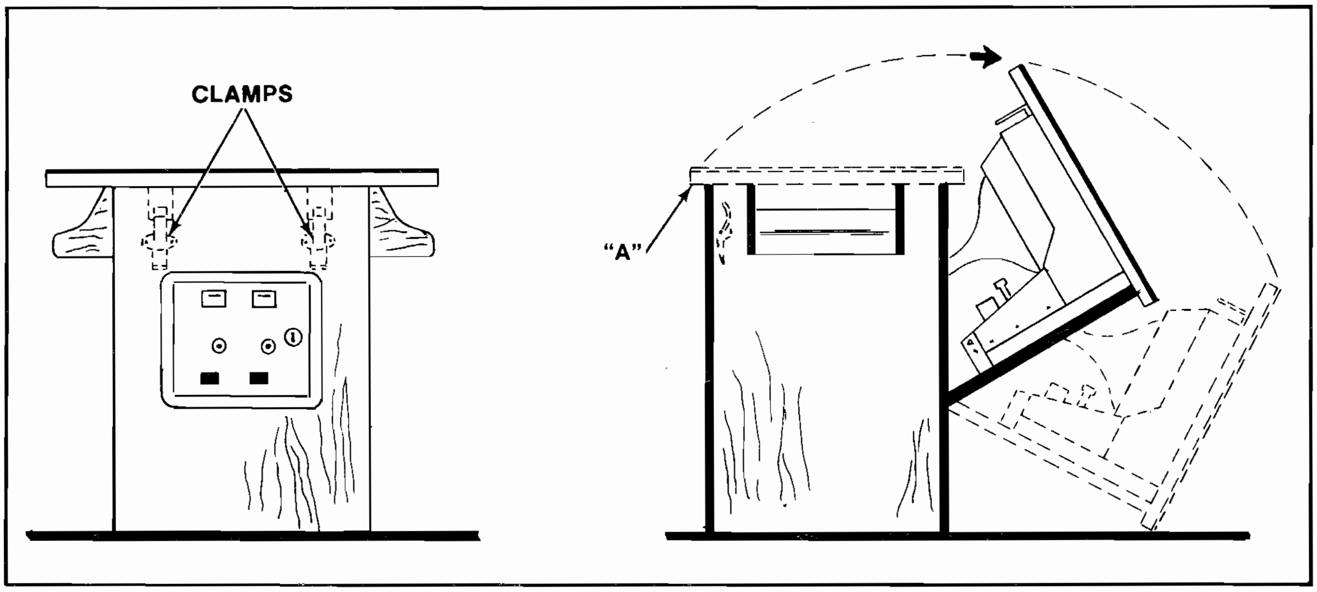


Figure 4-10 Opening the Cocktail Game

CAUTION: due to the weight of the monitor, EXTREME CARE MUST be taken when opening the cabinet.

- ☐ Remove the screws which hold the table top glass clamps in place.
- ☐ Remove the table top glass.
- ☐ Lift out the T.V. bezel assembly.
- ☐ Completely disconnect the T.V. monitor from all its cabling. DON'T FORGET THE CHASSIS GROUND WIRE.
- ☐ Remove the screws holding the T.V. monitor chassis to the "L" brackets by the door hinge(s). See Figure 4-11.
- ☐ Close the Cocktail Table and re-latch it.
- ☐ Remove the screws which secure the T.V. monitor mounting brackets to the edges of the slot cut in the table top. See Figure 4-11.
- ☐ Pry up the end of each monitor mounting bracket with a screwdriver or similar tool until you can grasp them both.
- ☐ Lift the T.V. monitor straight up and out of the table top being very careful not to bump the neck of the picture tube.
- ☐ To reinstall the T.V. monitor assembly, reverse this procedure.
- ☐ Be sure to check the clearance of the "L" brackets BEFORE setting the monitor into the table top.
- ☐ After replacing the T.V. monitor, be sure to run the game Self-Test.

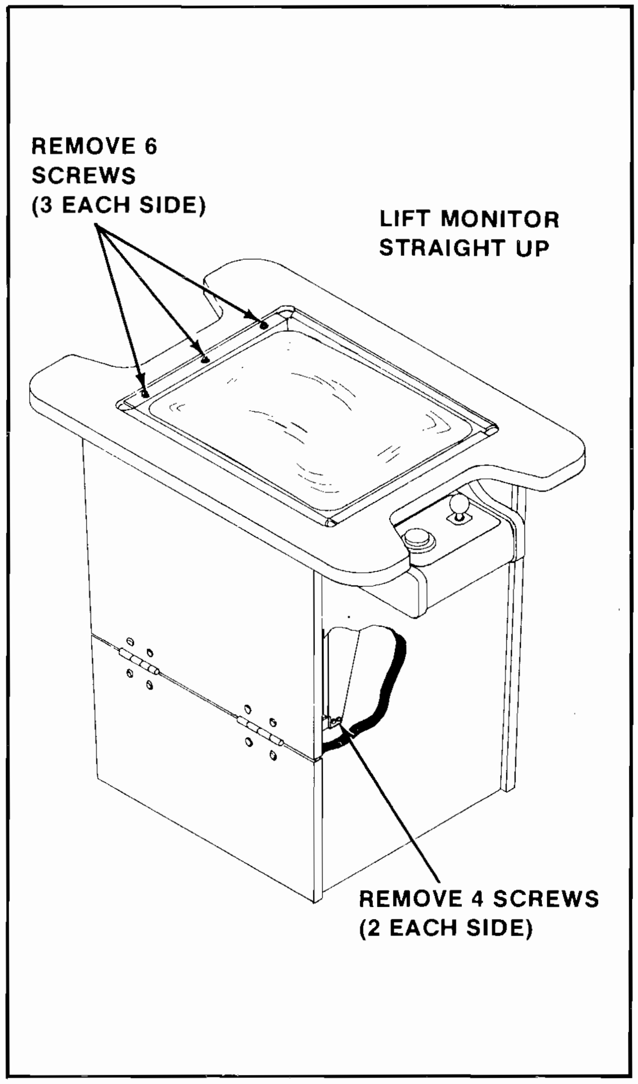


Figure 4-11 Removing the Monitor — Cocktail

PRINTED CIRCUIT BOARD (P.C.B.) REPLACMENT

1. UPRIGHT MODEL: See Figure 4-12.

- ☐ **Turn the power to the game off.**
- ☐ Unlock and open the rear access door.
- ☐ Disconnect all cabling from the P.C. boards and lift them out of their card rack.
- ☐ Disconnect the linear power supply board from all its cabling, remove the P.C.B. supports indicated in Figure 4-12, and slide the linear power supply board out the back of the cabinet.
- ☐ To reinstall the above P.C.B.'s, reverse this procedure.

NOTE: P.C.B.'s are all keyed and will ONLY fit into their connectors one way without forcing them. The plugs on the cable harness which connect it to the P.C.B.'s are also keyed and will ONLY go onto their connectors one way without forcing them.

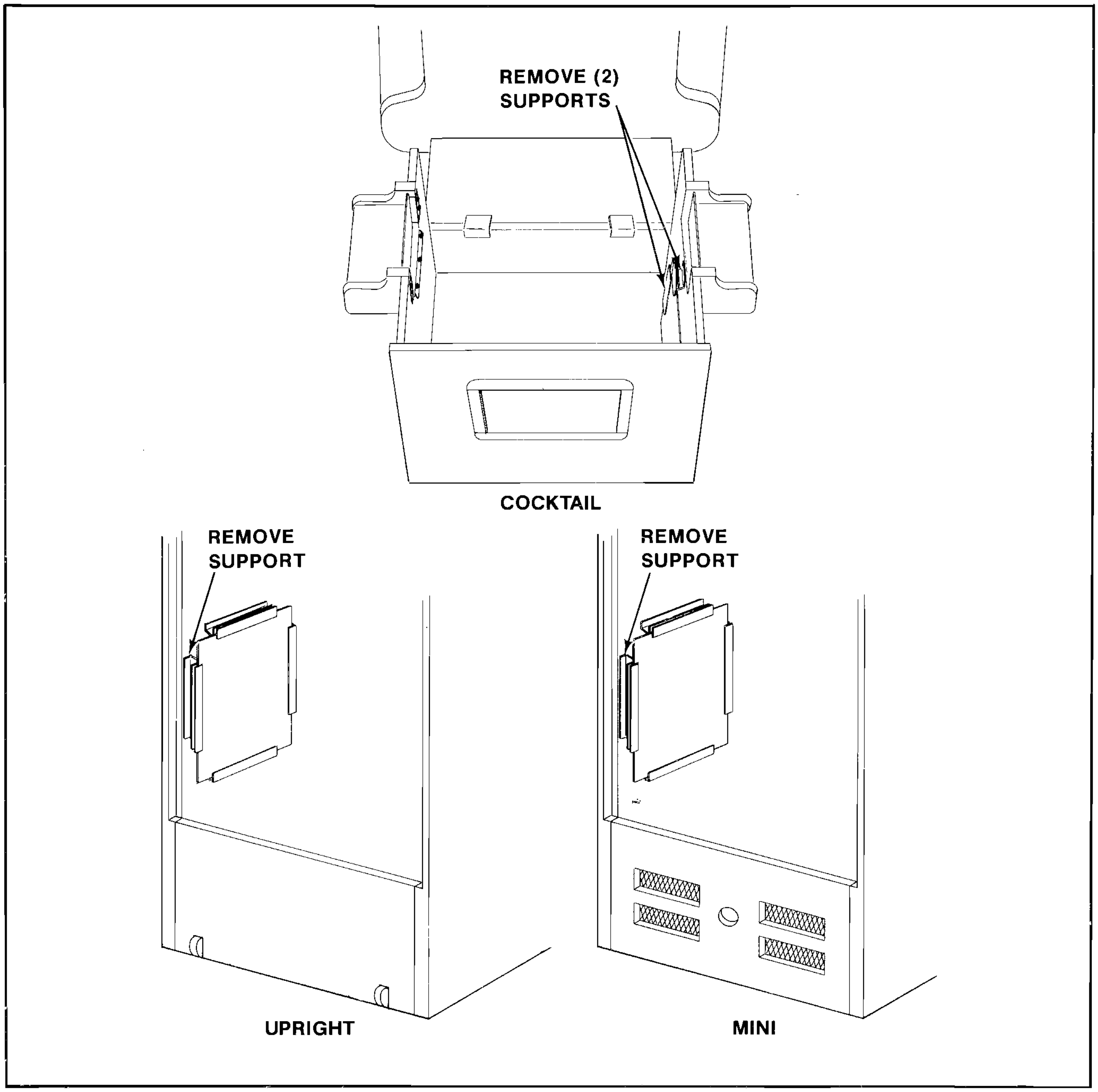


Figure 4-12 Removing P.C.B.s

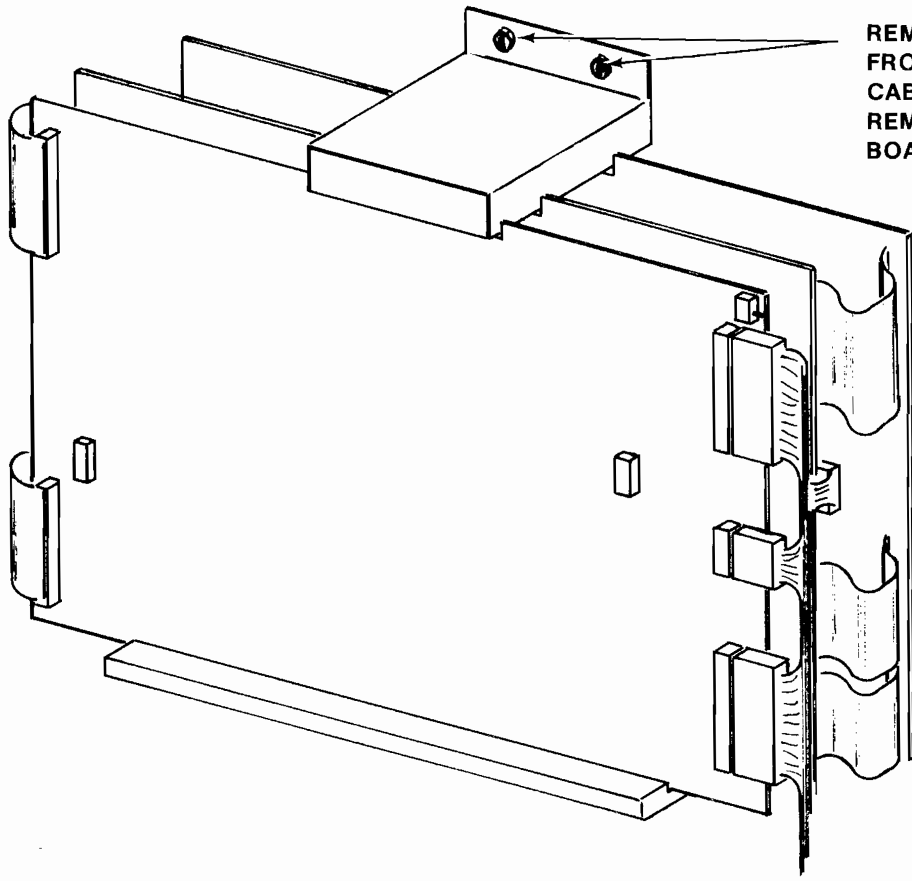


Figure 4-13 Removing P.C.B.s from Card Rack

2. **MINI MODEL:** See Figure 4-12.
   - ☐ **Turn the power off to the game.**
   - ☐ Unlock and open the rear access door.
   - ☐ Disconnect all cabling from the P.C. boards and lift them out of their card rack.
   - ☐ Disconnect the linear power supply board from all its cabling, remove the P.C.B. supports indicated in Figure 4-12, and slide the linear power supply board out the back of the cabinet.
   - ☐ To reinstall the above P.C.B.'s, reverse this procedure.
3. **COCKTAIL TABLE MODEL:** See Figure 4-12.
   - ☐ **Turn the power off to the game.**
   - ☐ Open the cabinet:

     Open the coin box door and release the two latches indicated in Figure 4-10.

CAUTION: The right hand latch is very close to the HIGH VOLTAGE on the monitor. BE CAREFUL!!

Once they're release, unhook them from their latch plates.

- ☐ Grasp the table top at "A" and open it as indicated in Figure 4-10.

CAUTION: Due to the weight of the monitor, EXTREME CARE MUST be taken when opening the cabinet.

- ☐ Remove the linear power supply board. See Figure 4-12.

  Disconnect it from all its cabling.

  Remove the two smallest P.C.B. supports.

  Once these are removed, the linear power supply can be lifted out the top of the cabinet.

  To reinstall the linear power supply board, reverse this procedure.
- ☐ To remove the P.C. boards from the card rack. See Figure 4-13.

  Disconnect them from ALL their cabling.

  The P.C. boards are now free and can be slid from their rack.

  To reinstall the P.C. boards, reverse this procedure.

OPENING THE ATTRACTION PANEL

1. UPRIGHT MODEL:

☐ **Turn the power to the game off.**

☐ Opening the attraction panel:

Remove the screws which secure the top bracket in place. (They are on its top side.) See Figure 4-14.

Remove the top bracket and slide up the attraction panel. This exposes the speaker board assembly on which is mounted the speakers, the fluorescent and black light tubes, and their mounting bracket assemblies. See Figure 4-14.

To reinstall the attraction panel, reverse this procedure.

☐ The fluorescent light tube may be replaced at this time. BE CAREFUL NOT TO DROP IT.

WARNING: If you drop a fluorescent tube and it breaks, IT WILL IMPLODE! Shattered glass can fly six (6) feet or more from the implosion. Use care when replacing any fluorescent tube.

☐ Replacing the fluorescent light tube starter. See Figure 4-15.

Be sure the power to the game has been turned off.

Grasp the starter (it is on the back of the mounting bracket), give it a quarter turn, and remove it from its socket.

To replace the fluorescent light tube starter, reverse this procedure.

☐ The ultraviolet light tube may be replaced at this time by removing the rear access door of the game and the back scenery panel if necessary. See Figure 4-16. BE CAREFUL NOT TO DROP IT.

WARNING: If you drop an ultraviolet light tube and it breaks, IT WILL IMPLODE! Shattered glass can fly six (6) feet or more from the implosion. Use care when replacing any ultraviolet tube.

☐ Replacing the ultraviolet light tube starter. See Figure 4-15.

Be sure the power to the game has been turned off.

Grasp the starter (it is on the back of the mounting bracket), give it a quarter turn, and remove it from its socket.

To replace the ultraviolet light tube starter, reverse this procedure.

☐ Removing the speaker board assembly:

The attraction panel, the rear access door of the game, and, if necessary, the back scenery panel **MUST** be removed first. This will enable you to reach all the necessary areas where cables **MUST** be disconnected.

Disconnect the speaker board assembly from all its cabling. There is one plug at the upper right and upper left corners of the rear of the cabinet. There is also a small plug right at the ON/OFF switch. And DO NOT FORGET TO DISCONNECT THE GROUND WIRE LUG FROM THE ON/OFF SWITCH!

Remove the screws which secure the speaker board assembly to the cabinet.

The speaker board assembly is now free and can be slid out through the hole in the front of the game where the attraction panel was mounted.

To reinstall the speaker board assembly, reverse this procedure.

☐ Replacement of the fluorescent and ultraviolet tube mounting bracket assemblies.

Disconnect it from its power cable.

Remove the screws which secure them to the speaker board assembly.

To reinstall the fluorescent ultraviolet tube mounting bracket assemblies, reverse this procedure.

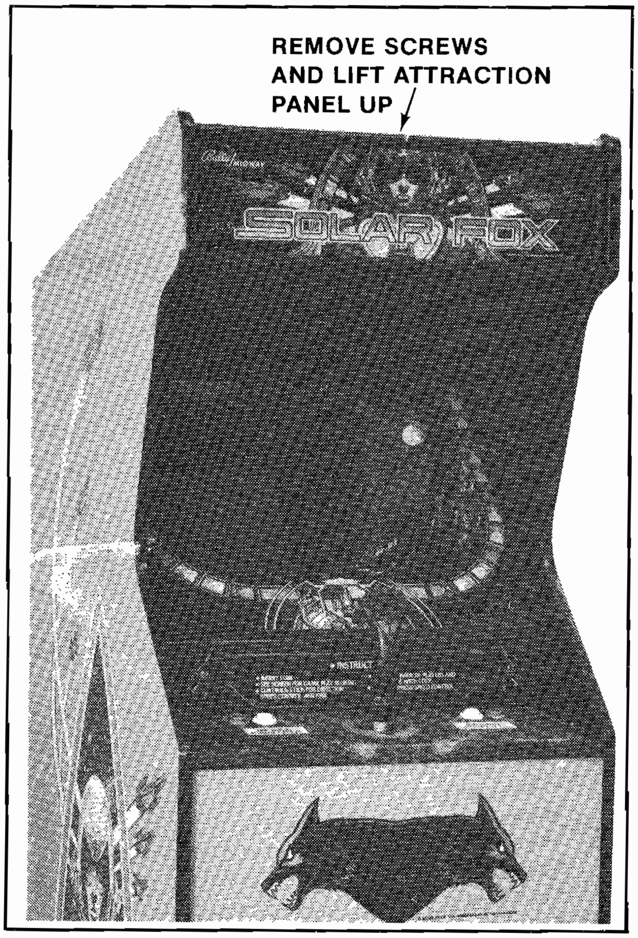


Figure 4-14 Opening the Attraction Panel — Upright

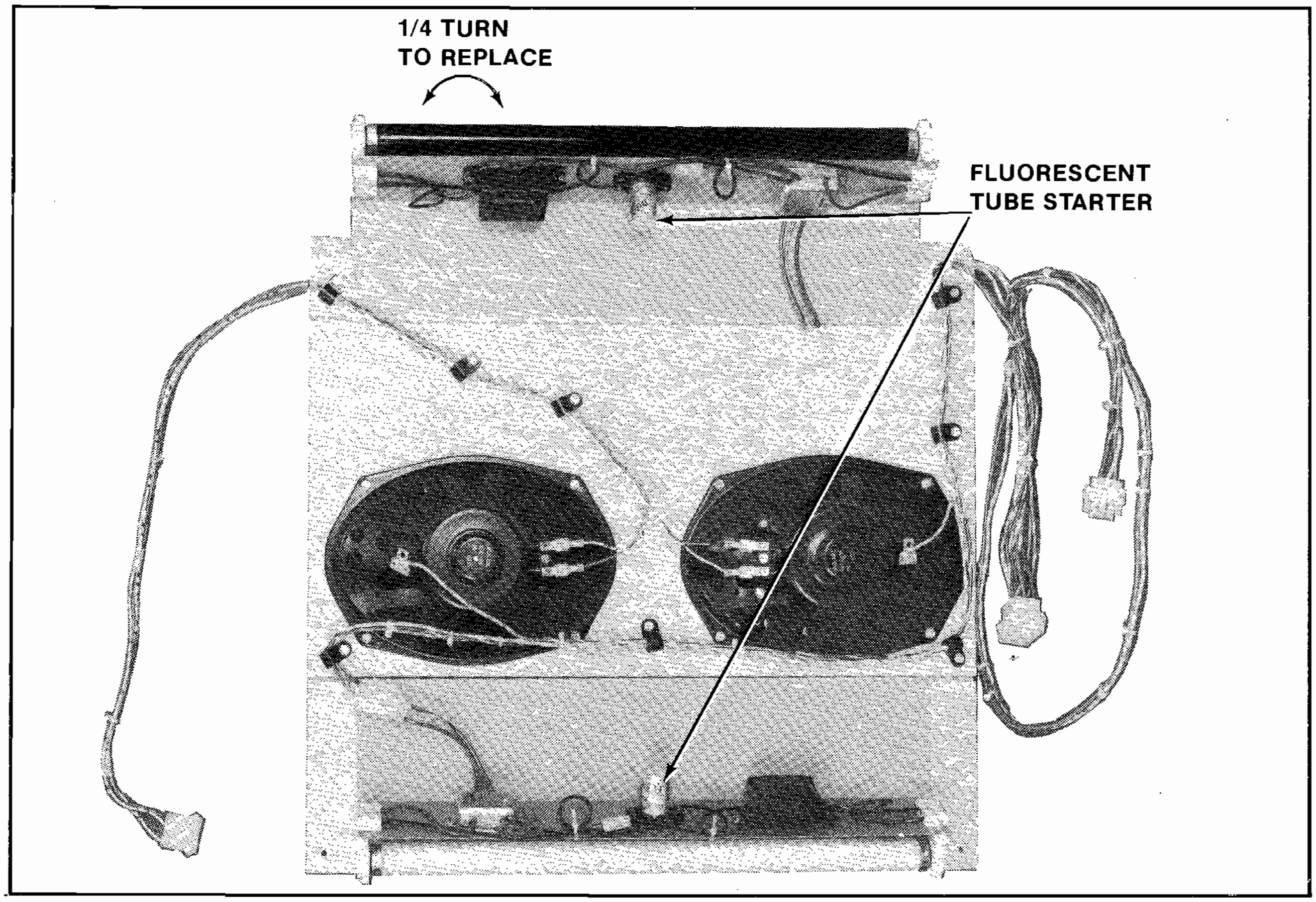


Figure 4-15 Replacing Fluorescent Tube Starter

☐ Replacing the speaker(s).

Disconnect the speaker(s) from its cabling.

Remove the nuts and bolts which secure the speaker in place and set them aside.

Once they bolts which secure the speaker(s) in place are removed, the speaker(s) may be removed from the speaker board assembly.

Reverse this procedure to reinstall the speaker(s).

2. MINI MODEL. See Figure 4-17.

☐ **Turn the power off to the game.**

☐ Remove the screws from the top and bottom of the formed attraction panel.

☐ Remove the formed attraction panel by pulling it straight away from the cabinet. This exposes the attraction panel light bulbs and their mounting board.

☐ To service the light bulbs and their mounting board:

Turn the power to the game back on so you can see which bulbs are burnt out.

Mark the burnt out bulbs and turn the power to the game back off again.

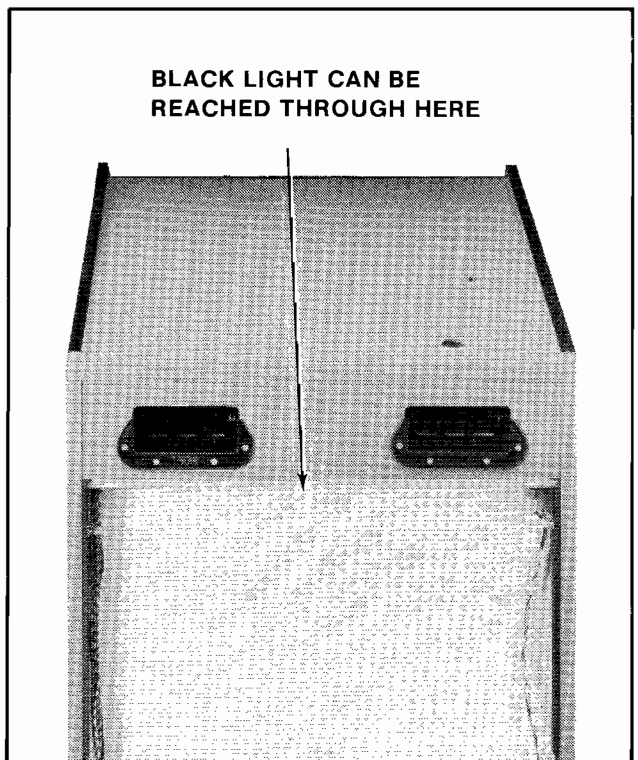


Figure 4-16 Replacing Black Light

To replace the burnt out bulbs, grasp them gently and pull straight out.

The new bulbs are gently pushed into the empty sockets.

To completely replace the light bulb mounting board:

Open the cabinet rear access door and unplug the mounting board from its power cable.

Remove the screws that hold the mounting board to the cabinet.

Gently slide the mounting board out the front of the cabinet being careful not to catch its cable on anything.

To reinstall the above removed items, reverse this procedure.

☐ To replace the speaker.

Be sure the power is off to the game.

Disconnect the speaker from its cabling.

Remove the nuts and bolts securing the speaker.

Slide the speaker out through the rear access door.

To reinstall the speaker, simply reverse this procedure.

3. THE COCKTAIL TABLE MODEL HAS NO BACK-LIT ATTRACTION PANEL.

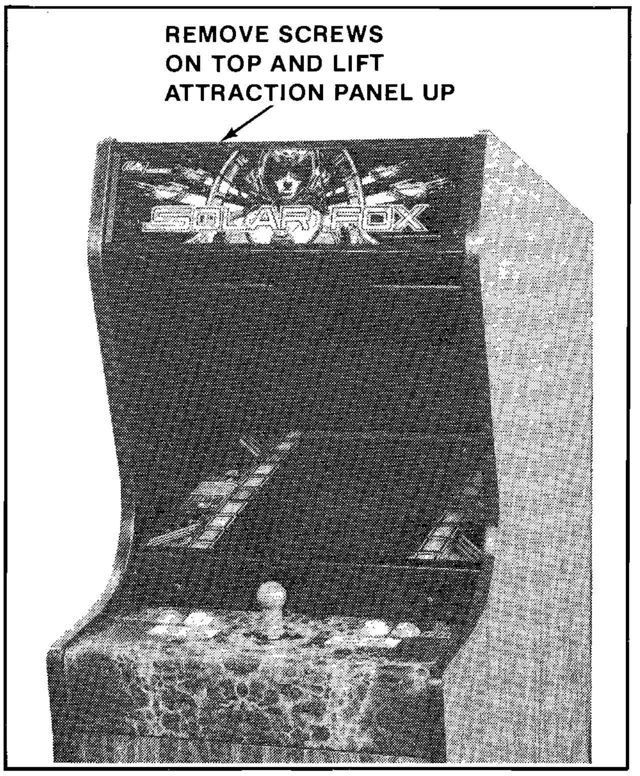


Figure 4-17 Opening the Attraction Panel — Mini

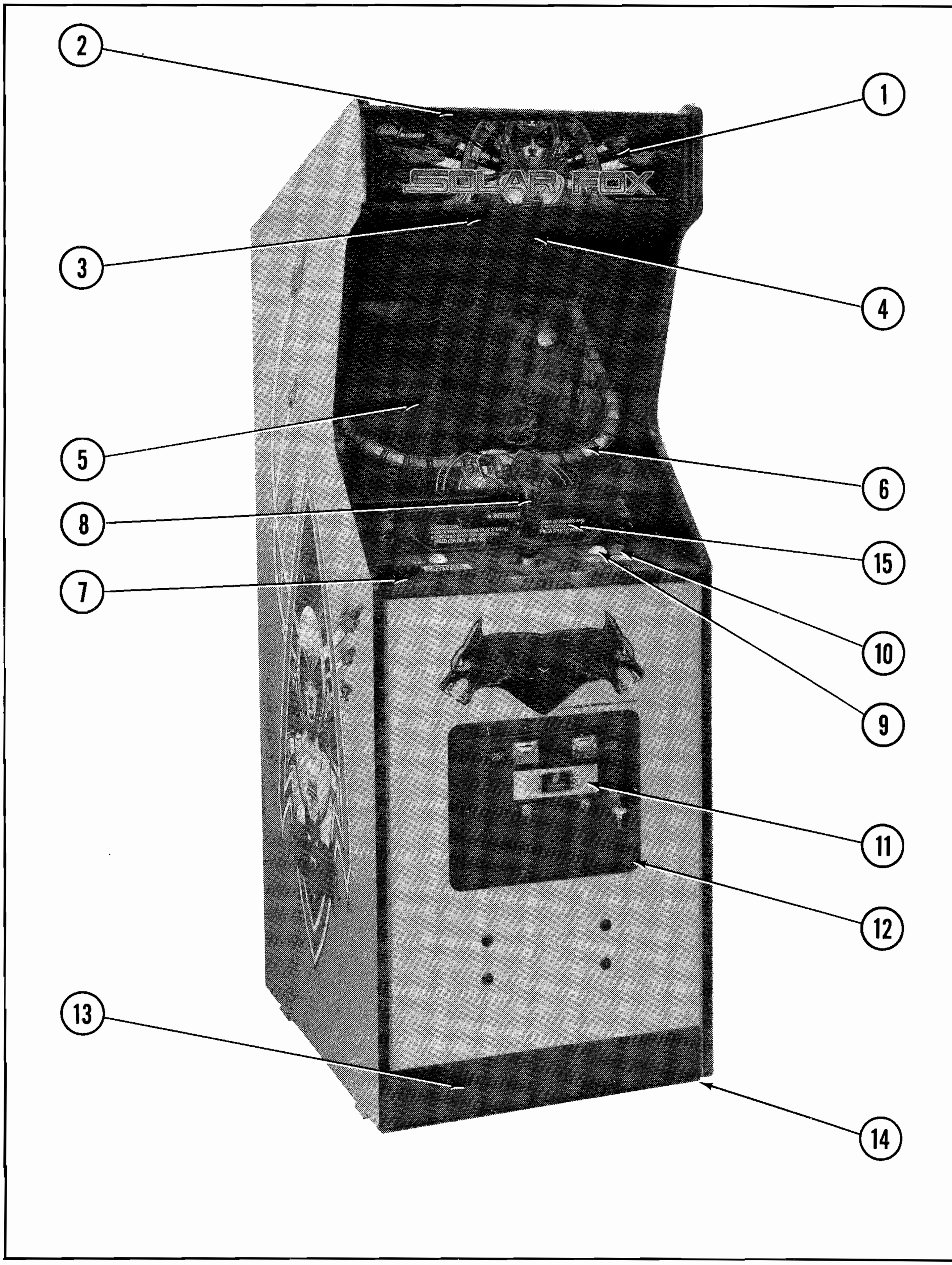
V Illustrated Parts Breakdown

SOLAR FOX — ALL VERSIONS — NOT SHOWN — PARTS LIST

ORDER BY PART NUMBER ***ONLY***

ITEM	PART NO.	DESCRIPTION
		TRANSFORMER BOARD ASSY.
	MT00-00089-A000	POWER TRANSFORMER — 115V., 60 HZ (UPRIGHT & MINI)
	MT00-00092-0000	TRANSFORMER (UPRIGHT & MINI)
	MT00-00096-0000	POWER TRANSFORMER — 110/125V., 60 HZ (COCKTAIL ONLY)
	MT00-00093-0000	TRANSFORMER W/MAGNETIC SHIELD (COCKTAIL ONLY)
	0017-00101-0628	#8-32 x 3/4 CARRIAGE BOLT (4 REQ'D.)
	0017-00104-0026	#8 FLAT WASHER (4 REQ'D.)
	0017-00103-0008	#8-32 HEX NUT (4 REQ'D.)
	0017-00101-0141	#8 x 11/16 UNSLOT. HEX HD. SCREW (22 REQ'D.)
	0720-00001-0100	1 POS. FUSE CLIP ASSY. (UPRIGHT & MINI)
	0720-00001-0200	2 POS. FUSE CLIP ASSY. (MINI & COCKTAIL)
	0720-00001-0300	3 POS. FUSE CLIP ASSY. (UPRIGHT & COCKTAIL)
	0017-00003-0002	SLO-BLO FUSE 1/2A., 250V. (UPRIGHT & COCKTAIL)
	0017-00003-0004	SLO-BLO FUSE 2A., 250V. (UPRIGHT—2, MINI—2, COCKTAIL—3)
	0017-00003-0217	SLO-BLO FUSE 2-1/2A., 250V. (ALL)
	A945-00002-0000	125VA. FILTER ASSY.
	A151-00079-0000	115V. CONVENIENCE OUTLET
	A508-00037-0000	2 LEAD TRANSFORMER BD, FILTER ASSY.
	A945-00005-0000	CAPACITOR ASSY. — 60 HZ (UPRIGHT & COCKTAIL)
	A945-00005-0100	CAPACITOR ASSY. — 60 HZ (MINI)
	0017-00003-0379	CAPACITOR CLAMP
	0017-00021-0370	MALE CONNECTOR — 5 TAB
	0017-00021-0624	TERMINAL STRIP (COCKTAIL)
	3010-13106-0000	TERMINAL STRIP (UPRIGHT & MINI)
	3000-17246-0500	5.50 x .350 GROUND STRAP (UPRIGHT)
	3000-17246-0900	48.00 x .350 GROUND STRAP (UPRIGHT)
	3000-17246-1000	36.00 x .350 GROUND STRAP (COCKTAIL)
	3000-17246-1100	30.00 x .350 GROUND STRAP (MINI & COCKTAIL)
	3010-03003-0000	GROUNDING CLIP
		CARD RACK W/BOARDS ASSY.
	A084-90009-A982	CPU BOARD ASSY. (UPRIGHT)
	A084-90009-A580	CPU BOARD ASSY. (MINI & COCKTAIL)
	A084-90908-B982	SOUND BOARD
	A084-91399-A982	VIDEO GENERATOR BOARD (UPRIGHT)
	A084-91399-A580	VIDEO GENERATOR BOARD (MINI & COCKTAIL)
	0017-00042-0208	P.C. BOARD SPACER SUPPORT 1-1/8" LG. (4 REQ'D.)
	0017-00042-0287	P.C. BOARD SPACER SUPPORT 5/8" LG. (4 REQ'D.)
	0017-00101-0085	#6 x 5/16 SLT. HEX HD. SCREW (8 REQ'D.)
	0968-00511-0000	BASE CARD RACK SUPPORT — BLOCK
	0017-00101-0033	#8 x 1-1/4" SLT. HEX HD. SCREW (2 REQ'D.)
	0017-00104-0031	#8 WASHER (2 REQ'D.)
	0968-00510-0000	TOP CARD RACK SUPPORT — BLOCK
	0968-00125-0000	SUPPORT BRKT. TO CABINET SIDE
	0017-00101-0014	#6 x 1/2 SLT. HEX HD. SCREW (2 REQ'D.)

NO. 982 — SOLAR FOX — UPRIGHT — FRONT

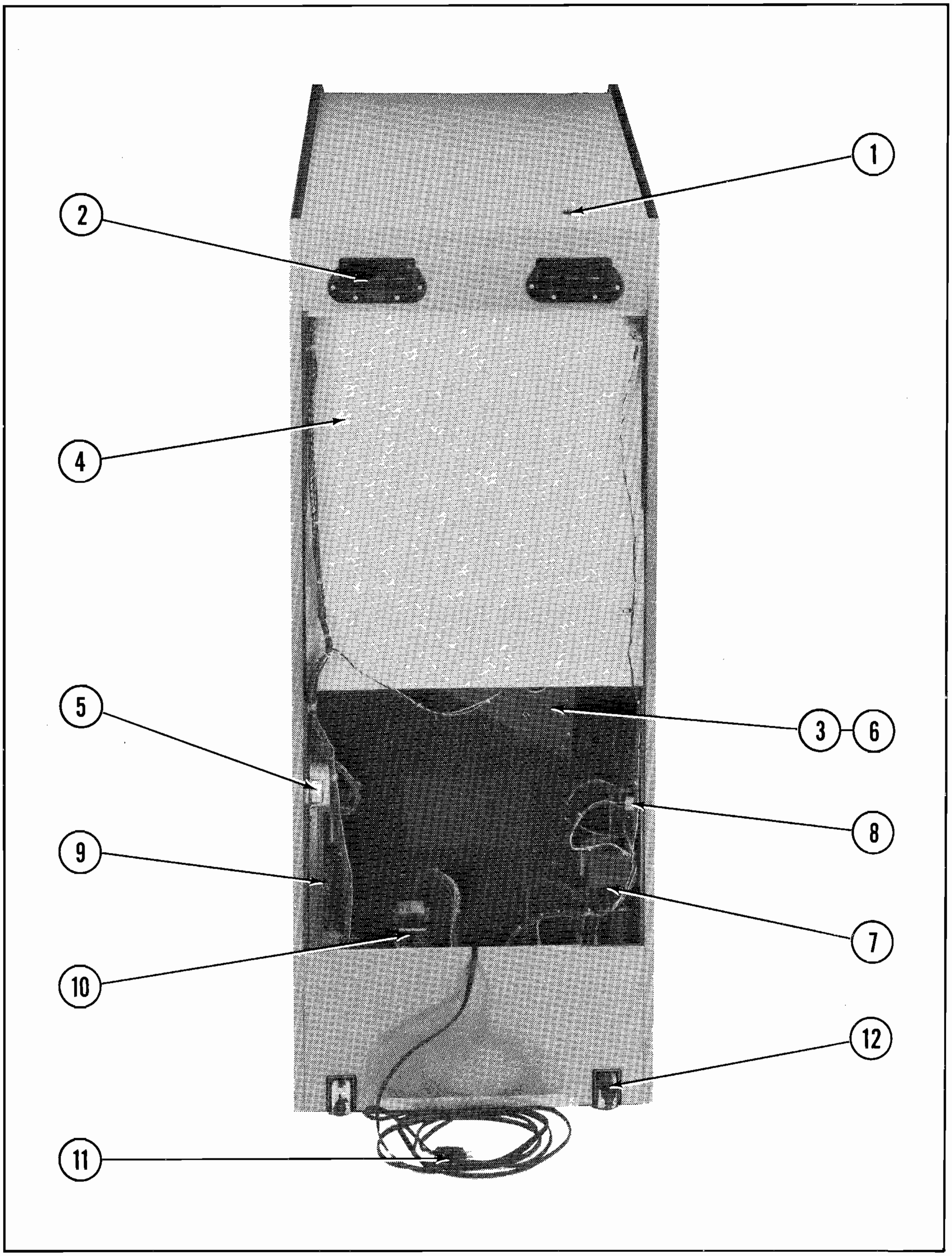


NO. 982 — SOLAR FOX — UPRIGHT — FRONT — PARTS LIST

*ORDER BY PART NUMBER **ONLY***

ITEM	PART NO.	DESCRIPTION
1	0982-00900-00XF	DISPLAY HEADER
	0537-00903-0061	GLASS CHANNEL 5-5/16 LG. (2 REQ'D.)
2	0508-00104-0000	HEADER RETAINER BRKT. — UPPER
3	0982-00101-00XF	RETAINER/GRILLE
	0017-00101-0138	#8 x 5/8 TORX TAMPER RESISTANT SCREW (15 REQ'D.)
	0017-00009-0522	LONG ARM KEY T-20 (FOR ABOVE SCREW)
4	A982-00025-0000	SPEAKER BOARD ASSY.
	A982-00022-0000	A.C. ADAPTOR CABLE ASSY.
	A982-00023-0000	SPEAKER CABLE ASSY.
5	0982-00902-00XF	MIRROR
6	0982-00905-00XF	MAIN VIEWING GLASS
	0537-00903-0017	GLASS CHANNEL 18-3/4 LG. (2 REQ'D.)
7	A982-00020-0000	CONTROL SHELF PLATE ASSY.
	0982-00904-0000	CONTROL SHELF OVERLAY
	0550-00101-0100	CONTROL SHELF MTG. BRKT. — RIGHT
	0550-00101-0200	CONTROL SHELF MTG. BRKT. — LEFT
	0555-00901-0000	PLASTIC LOCATING PIN (8 REQ'D.)
	0961-00115-00XF	STRIKE (2 REQ'D.)
	0017-00009-0033	LATCH (2 REQ'D.)
8	A982-00031-0000	CONTROL GRIP ASSY.
9	0017-00042-0301	YELLOW PUSH BUTTON ASSY. (2 REQ'D.)
10	0017-00042-0304	RED PUSH BUTTON ASSY. (2 REQ'D.)
	0017-00032-0093	PUSH BUTTON SWITCH W/HOLDER (4 REQ'D.)
	0017-00103-0054	5/8-11 PAL NUT (4 REQ'D.)
11	A090-00300-11BK	U.S.A. 25¢ COIN DOOR ASSY.
12	0090-00002-04BK	LARGE COIN DOOR FRAME
	0017-00101-0121	#6-32 x 5/16 PHIL. TRS. HD. SCREW (3 REQ'D.) (MOUNTS COIN DOOR TO FRAME)
13	0935-00906-0100	KICK PLATE
14	0017-00102-0048	3/8-16 x 2" LEG LEVELER (4 REQ'D.)
	0017-00103-0026	3/8-16 LEG LEVELER NUTS (4 REQ'D.)
15	0982-00106-00XF	GLASS CLAMPING PLATE
	0017-00101-0138	#8 x 5/8 TORX TAMPER RESISTANT SCREW (3 REQ'D.)

NO. 982 - SOLAR FOX — UPRIGHT — REAR ACCESS



NO. 982 — SOLAR FOX — UPRIGHT — REAR ACCESS — PARTS LIST

*ORDER BY PART NUMBER **ONLY***

ITEM	PART NO.	DESCRIPTION
1	A088-00013-0000	ON/OFF SWITCH AND BRKT. ASSY.
2	0894-00916-0000	PLASTIC PULL AND VENT (2 REQ'D.)
3	0982-00906-0000	MONITOR MASK
	0982-00902-00XF	MIRROR
4	0982-00903-00XF	REAR SCENERY
5	A088-00015-0000	INTERLOCK SWITCH AND BRKT. ASSY.
6	0017-00003-0339	ELECTROHOME — 19" COLOR DUAL SYNC. HORIZ. MTG. MONITOR (OR)
6	0017-00003-0439	WELLS GARDNER — 19" COLOR DUAL SYNC. HORIZ. MTG. MONITOR
	A508-00005-0000	MONITOR MTG. CHANNEL ASSY. (2 REQ'D.)
	0595-00104-0000	MONITOR RAIL (2 REQ'D.)
	0017-00102-0066	1/4-20 x 3/4 UNSLOT HEX HD. BOLT (4 REQ'D.)
	0017-00102-0002	1/4-20 x 1/2 SLOT HEX HD. BOLT (4 REQ'D.)
	0017-00104-0014	7/8" DISH WASHER (8 REQ'D.)
	0017-00101-0141	#8 x 11/16 UNSLOT HEX HD. SCREW (8 REQ'D.)
	0017-00104-0046	7/8" FLAT WASHER (8 REQ'D.)
	0982-00907-0000	MONITOR SHIELD (FISH PAPER)
7	A982-00007-0000	CARD RACK W/BOARDS ASSY.
	A084-90908-B982	SOUND BOARD ASSY.
	A084-90009-A982	CPU BOARD ASSY.
	A084-91399-A982	VIDEO GENERATOR BOARD ASSY.
	A968-00018-0000	SUPPORT BRKT. ASSY. — TOP
	0968-00511-0000	CARD SUPPORT BASE — BOTTOM
8	A082-90910-E000	DUAL POWER AMP P.C. ASSY.
9	A082-90412-D000	125VA. POWER SUPPLY P.C. ASSY.
	0624-00902-0100	P.C. SUPPORT BRKT. 12" (2 REQ'D.)
	0624-00902-0500	P.C. SUPPORT BRKT. 6-1/2" (2 REQ'D.)
10	A982-00009-0000	TRANSFORMER BOARD ASSY.
11	A508-00023-0000	LINE CORD ASSY.
12	A961-00007-0000	CASTER ASSY. (2 REQ'D.)
	0961-00109-0000	WHEEL BRKT. (2 REQ'D.)
	0017-00042-0255	PLASTIC WHEEL (2 REQ'D.)
	0894-00702-00XF	SHAFT (2 REQ'D.)
	0017-00100-0037	3/8 E-RING (2 REQ'D.)
		ADDITIONAL PARTS LIST
	A515-00021-0000	MULTIFUNCTION SWITCH & BRKT. ASSY.
	A097-00009-0000	BACK DOOR LOCK ASSY.
	0017-00009-0490	5-5/8 SQR. BACK DOOR VENT GRILLE (4 REQ'D.)
	A950-00006-0000	COIN BOX CRADLE ASSY.
	0950-00105-0000	COIN BOX COVER
	0950-00104-0000	COIN BOX HANDLE
	0950-00101-0000	COIN DEFLECTOR (2 REQ'D.)
	0950-00900-0000	LARGE PLASTIC CASH BOX
	0017-00101-0142	1/4-20 x 1-3/8 RND. HD. BOLT (4 REQ'D.)
	0017-00104-0014	7/8 DISH WASHER (4 REQ'D.)
	0017-00103-0018	1/4-20 HEX NUT (4 REQ'D.)

NO. 982 — SOLAR FOX — UPRIGHT — REAR ACCESS — PARTS LIST (Continued)

ORDER BY PART NUMBER ***ONLY***

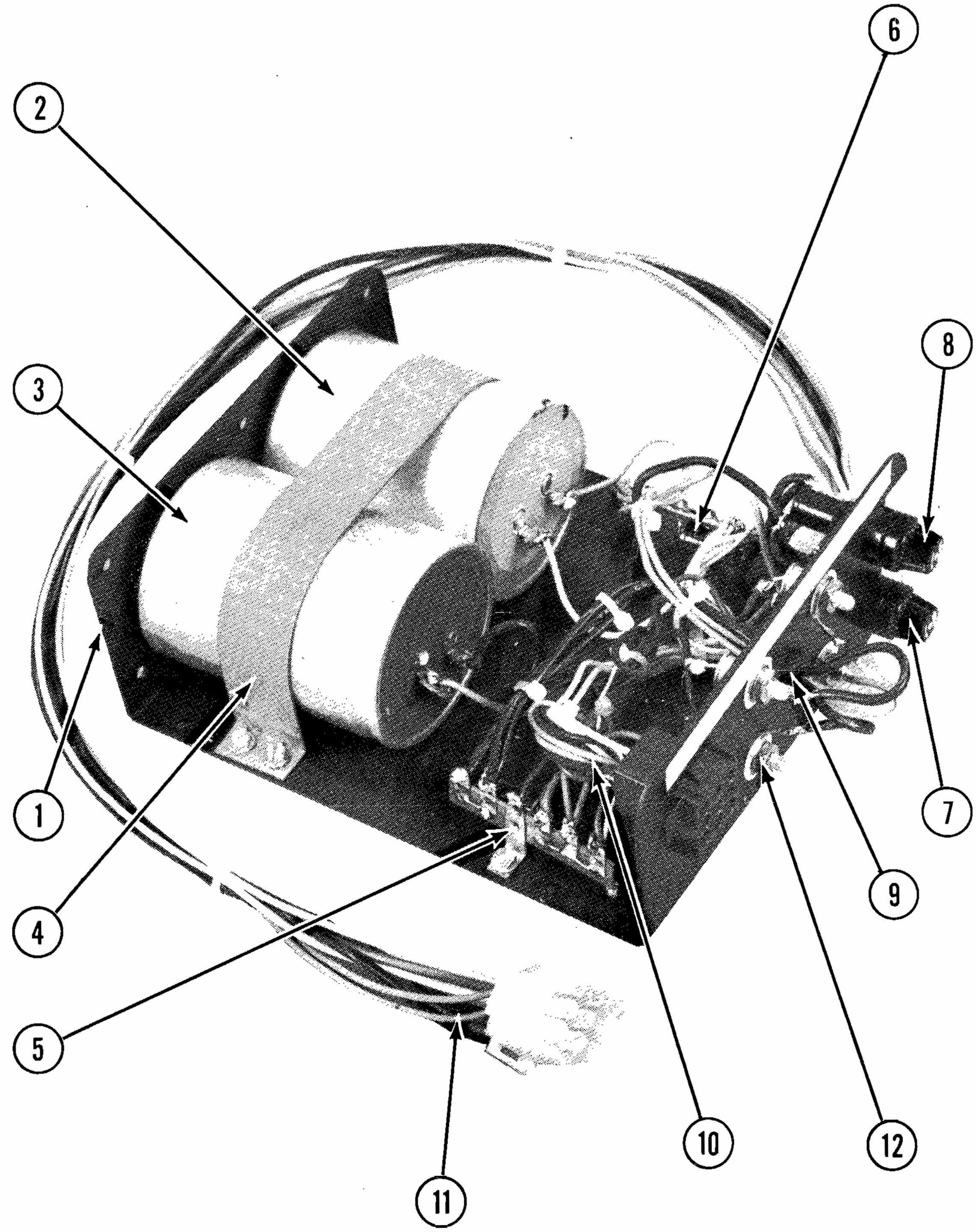
ITEM	PART NO.	DESCRIPTION
	A968-00029-0000	VIDEO SIGNAL CABLE ASSY.
	A982-00012-0000	MASTER CABLE ASSY.
	A089-00006-0000	125VA. FILTER CABLE ASSY. #1
	A089-00007-0000	125VA. FILTER CABLE ASSY. #2
	A982-00010-0000	HIGH VOLTAGE CABLE ASSY.
	A982-00011-0000	LOW VOLTAGE CABLE ASSY.
	A982-00015-0000	COIN DOOR CABLE ASSY.
	A982-00016-0000	CONTROL SHELF CABLE ASSY.

FILTER ASSY. — PARTS LIST

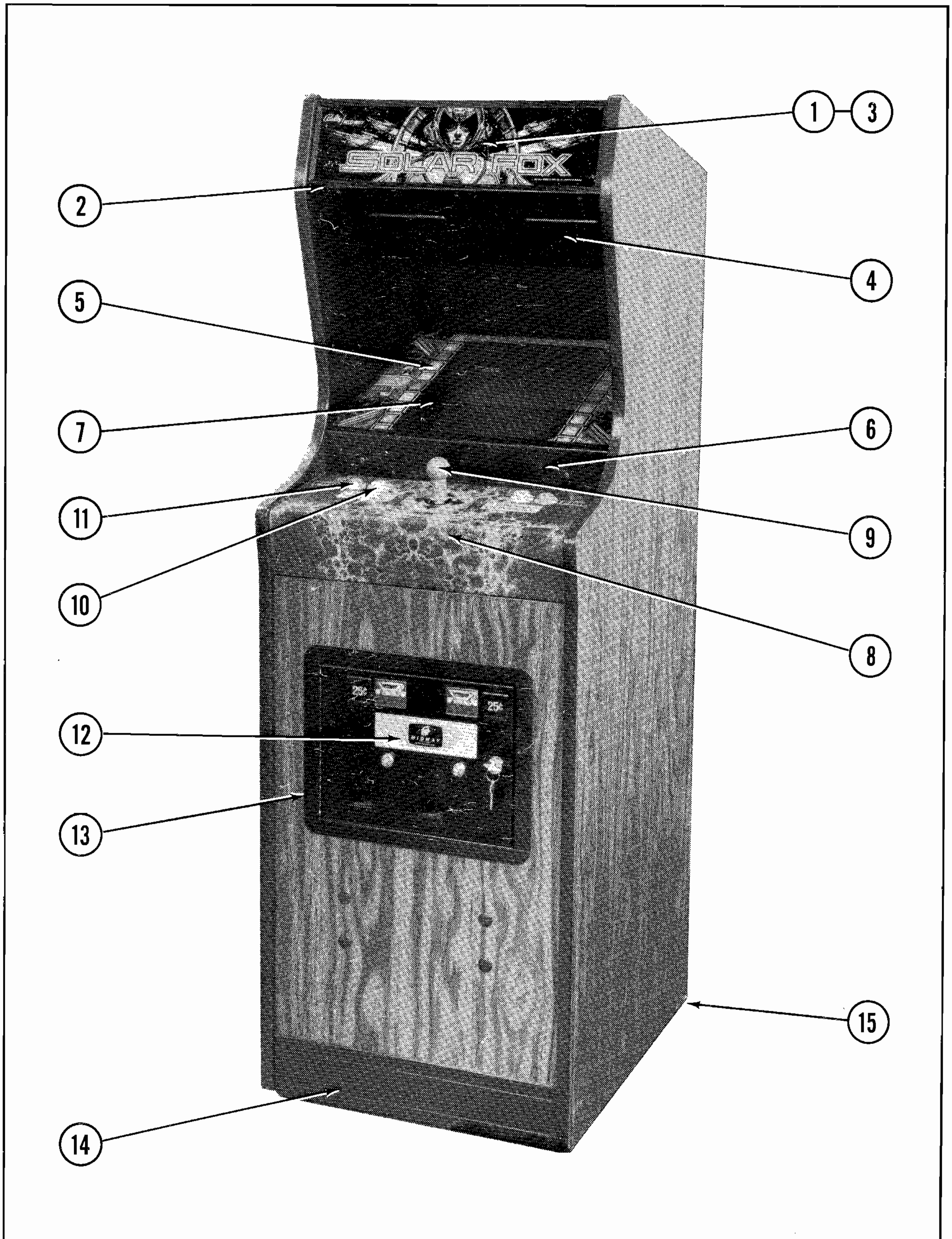
ORDER BY PART NUMBER ***ONLY***

ITEM	PART NO.	DESCRIPTION
1	0945-00101-00XF	CHASSIS
2	0945-00803-0100	CAPACITOR — 55000MF — 25V.
3	0945-00803-0200	CAPACITOR — 100000MF — 15V.
4	0945-00100-0000	CAPACITOR STRAP
	0017-00101-0555	#6-32 x 5/16 SLT. HEX HD. SCR. (4 REQ'D.)
5	0017-00021-0539	5 POSITION TERMINAL STRIP (2 REQ'D.)
	0017-00101-0510	#4-40 x 1/2 SLT. PAN HD. SCR. (4 REQ'D.)
	0017-00104-0087	#4 FLAT WASHER (4 REQ'D.)
	0017-00104-0071	#4 EXT. TOOTH WASHER (4 REQ'D.)
	0017-00103-0002	#4-40 HEX NUT (4 REQ'D.)
6	0062-122H7-1XXX	RESISTOR — 150 OHM, 2W.
	0062-086H7-1XXX	RESISTOR — 47 OHM, 2W. — LOCATED ON OPPOSITE TERMINAL STRIP
7	0017-00003-0008	FUSE — 6 AMP — 120V.
8	0017-00003-0174	FUSE — 10 AMP — 32V.
	0017-00003-0433	FUSE HOLDER (2 REQ'D.)
9	0017-00041-0008	RUBBER GROMMET
10	A089-00007-0000	FILTER CABLE ASSY. #2
11	A089-00006-0000	FILTER CABLE ASSY. #1
12	0945-00804-0100	DIODE — 12A. — 50V. (4 REQ'D.)
	0017-00103-0086	#10-32 HEX NUT (4 REQ'D.)
	0017-00021-0484	SOLDER LUG (4 REQ'D.)
	0017-00104-0107	#10 FLAT WASHER (4 REQ'D.)
	0017-00009-0510	INSULATOR (8 REQ'D.)
	0017-00042-0283	BUSHING (4 REQ'D.)
	0945-00900-0000	DIODE FORMED FISHPAPER COVER — NOT SHOWN

FILTER ASSY.



NO. 578 — SOLAR FOX — MINI — FRONT

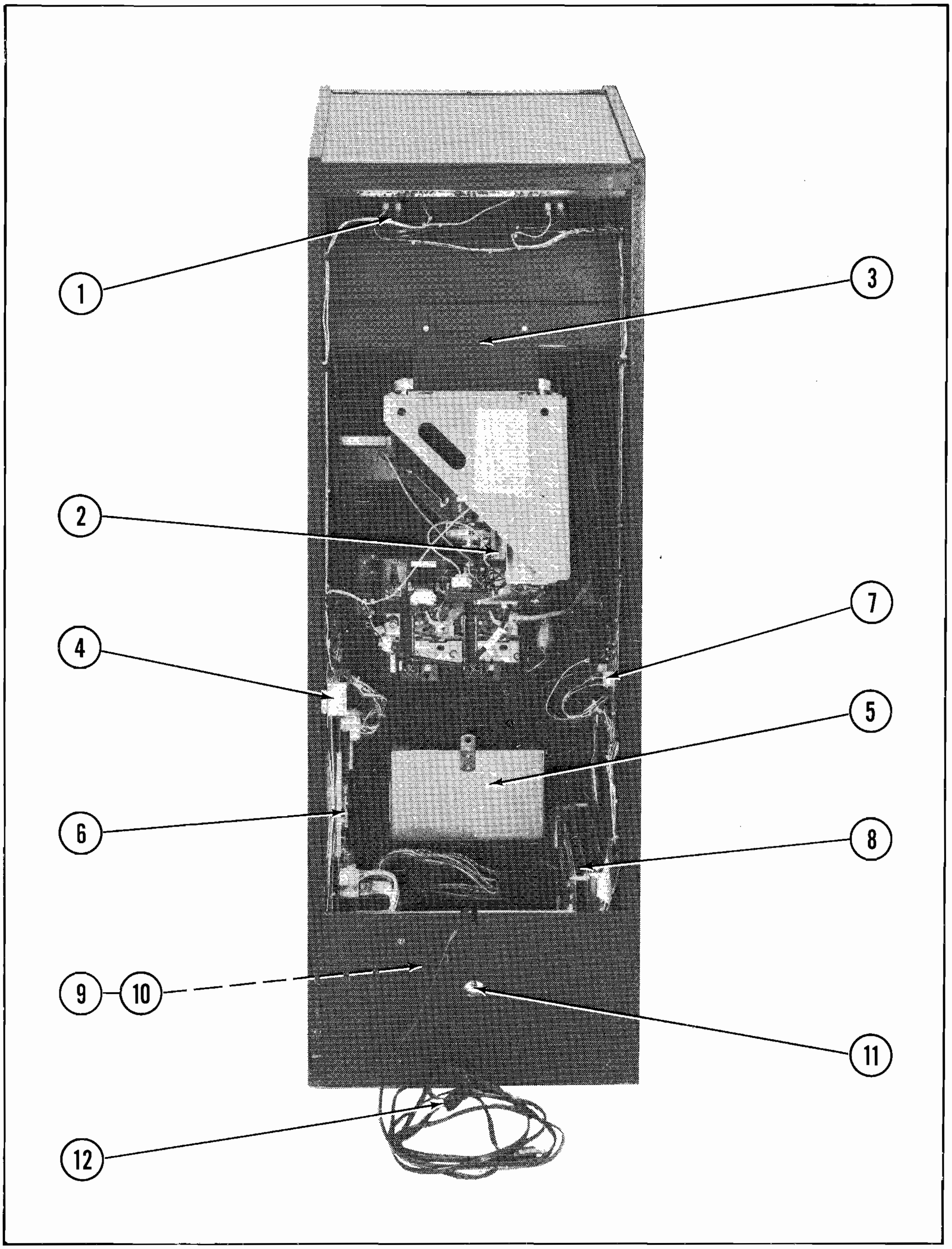


NO. 578 — SOLAR FOX — MINI — FRONT — PARTS LIST

*ORDER BY PART NUMBER **ONLY***

ITEM	PART NO.	DESCRIPTION
1	0578-00901-00XF	HEADER DISPLAY PLEXI
	0537-00903-0060	GLASS CHANNEL 4-1/2" LG. (2 REQ'D.)
2	0574-00100-00XF	HEADER RETAINING BRKT. (2 REQ'D.)
	0017-00101-0138	#8 x 5/8" TORX TAMPER RESISTANT SCREW (6 REQ'D.)
	0017-00009-0522	LONG ARM KEY T-20 (FOR ABOVE SCREW)
3	A574-00007-0000	INSERT DISPLAY ASSY.
	0017-00003-0219	#194 LAMP 14V., .27A. (5 REQ'D.)
	0017-00031-0030	WEDGE BASE LAMP SOCKET (5 REQ'D.)
	A574-00015-0000	INSERT CABLE ASSY.
4	0017-00009-0393	BLACK SPEAKER GRILLE W/SLOTS (2 REQ'D.)
	0017-00003-0430	6" x 9" SPEAKER 4 OHM, 10W. (2 REQ'D.)
5	0578-00900-00XF	VIEWING GLASS
	0537-00903-0056	GLASS CHANNEL 14-1/2" LG. (2 REQ'D.)
6	A578-00019-0000	GLASS CLAMPING PLATE ASSY.
	0017-00101-0138	#8 x 5/8" TORX TAMPER RESISTANT SCREW (2 REQ'D.)
7	A514-00004-0000	T.V. BEZEL ASSY.
	0513-00900-0000	BEZEL
	0934-00905-0000	PLEXI-GLASS (TINTED)
	A961-00026-0000	BEZEL MTG. BRKT. ASSY. (2 REQ'D.)
8	A578-00016-0000	OVERLAY/CONTROL PLATE ASSY.
	A578-00017-0000	CONTROL SHELF PLATE
	0578-00902-0000	CONTROL SHELF OVERLAY
	0550-00101-0100	CONTROL SHELF MTG. BRKT. — RIGHT
	0550-00101-0200	CONTROL SHELF MTG. BRKT. — LEFT
	0555-00901-0000	PLASTIC LOCATING PIN (4 REQ'D.)
	0961-00115-00XF	STRIKE (2 REQ'D.)
	0017-00009-0033	LATCH CLAMP (2 REQ'D.)
9	A578-00022-0000	CONTROL ASSY.
10	0017-00042-0301	YELLOW PUSHBUTTON ASSY. (2 REQ'D.)
11	0017-00042-0304	RED PUSHBUTTON ASSY. (2 REQ'D.)
	0017-00032-0093	PUSHBUTTON SWITCH W/HOLDER (4 REQ'D.)
	0017-00103-0054	5/8-11 PAL NUT (4 REQ'D.)
12	A090-00300-11BK	U.S.A. 25¢ COIN DOOR ASSY.
13	0090-00002-04BK	LARGE COIN DOOR FRAME
	0017-00101-0121	#6-32 x 5/16 PHIL. TRS. HD. SCREW (3 REQ'D.) (MOUNTS COIN DOOR TO FRAME)
14	0935-00906-0400	KICK PLATE
15	0017-00102-0048	3/8-16 x 2" LEG LEVELERS (4 REQ'D.)
	0017-00103-0026	3/8-16 LEG LEVELER NUTS (4 REQ'D.)

NO. 578 — SOLAR FOX — MINI — REAR ACCESS

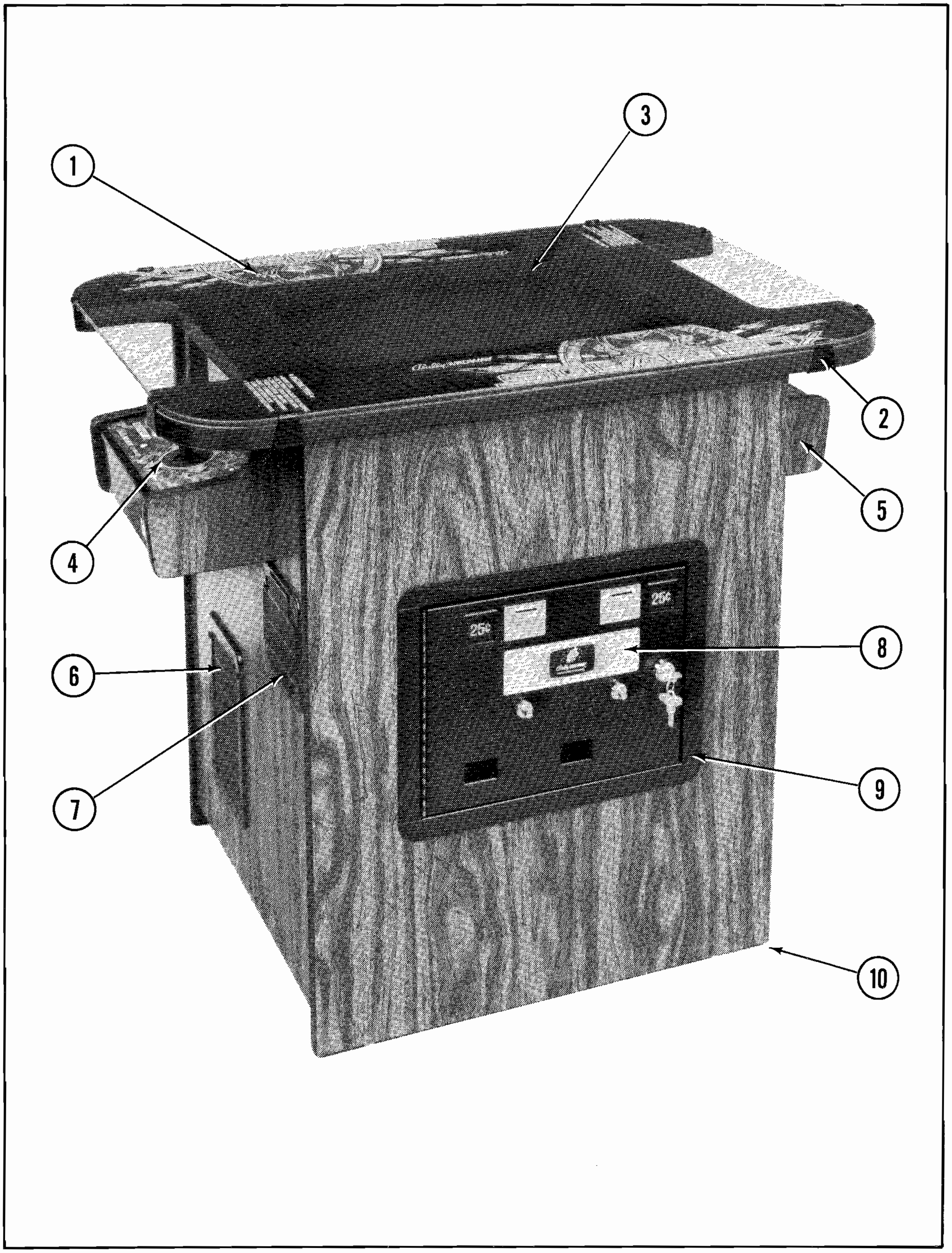


NO. 578 — SOLAR FOX — MINI — REAR ACCESS — PARTS LIST

ORDER BY PART NUMBER ***ONLY***

ITEM	PART NO.	DESCRIPTION
1	0017-00003-0430	6" x 9" SPEAKER 4 OHM, 10W. (2 REQ'D.)
2	0017-00003-0340	ELECTROHOME — 13" COLOR DUAL SYNC. HORIZ. MTG. MONITOR (OR)
2	0017-00003-0435	WELLS GARDNER — 13" COLOR DUAL SYNC. HORIZ. MTG. MONITOR
3	A926-00012-00XF	T.V. MONITOR BRKT. ASSY.
	0513-00101-0000	MONITOR MTG. BRKT.
	0017-00102-0066	1/4-20 x 3/4 UNSLOT HEX HD. BOLT (4 REQ'D.)
	0017-00104-0014	7/8 DISH WASHER
4	A088-00015-0000	INTERLOCK SWITCH & BRKT. ASSY.
5	A950-00004-0000	COIN BOX ASSY.
	A950-00006-0000	COIN BOX CRADLE ASSY.
	0950-00105-0000	COIN BOX COVER
	0950-00104-0000	COIN BOX HANDLE
	0950-00101-0000	COIN DEFLECTOR (2 REQ'D.)
	0950-00900-0000	LARGE PLASTIC CASH BOX
	0017-00101-0142	1/4-20 x 1-3/8 RND. HD. BOLT (4 REQ'D.)
	0017-00104-0014	7/8 DISH WASHER (4 REQ'D.)
	0017-00103-0018	1/4-20 HEX NUT (4 REQ'D.)
6	A082-90412-D000	125VA. POWER SUPPLY P.C. BD. ASSY.
	0624-00902-0100	P.C. SUPPORT BRKT. 12" LG. (2 REQ'D.)
	0624-00902-0500	P.C. SUPPORT BRKT. 6-1/2" LG. (2 REQ'D.)
7	A082-90910-E000	DUAL POWER AMP P.C. ASSY.
8	A580-00013-0000	CARD RACK W/BOARDS ASSY.
	A084-90009-0580	CPU BD. ASSY.
	A084-90908-B982	SOUND BD. ASSY.
	A084-91399-A580	VIDEO GENERATOR BD. ASSY.
	A968-00018-0000	SUPPORT BRKT. ASSY. — TOP
	0968-00511-0000	CARD SUPPORT BASE — BOTTOM
9	A568-00009-0000	TRANSFORMER BOARD ASSY.
10	A945-00002-0000	125VA. FILTER ASSY.
11	A088-00013-0000	ON/OFF SWITCH & BRKT. ASSY.
12	A508-00023-0000	LINE CORD ASSY.
		ADDITIONAL PARTS LIST
	A097-00009-0000	BACK DOOR LOCK ASSY.
	0017-00009-0490	5-5/8" SQR. BACK DOOR VENT GRILLE (4 REQ'D.)
	0926-00904-0000	PROTECTIVE BUBBLE — BACK DOOR
	A578-00010-0000	HIGH VOLTAGE CABLE ASSY.
	A578-00011-0000	LOW VOLTAGE CABLE ASSY.
	A578-00012-0000	MASTER CABLE ASSY.
	A968-00029-0000	VIDEO SIGNAL CABLE ASSY.
	A982-00015-0000	COIN DOOR CABLE ASSY.
	A578-00013-0000	CONTROL SHELF CABLE ASSY.
	A089-00006-0000	FILTER CABLE ASSY. #1
	A089-00007-0000	FILTER CABLE ASSY. #2
	0555-00901-0000	PLASTIC LOCATING PIN (6 REQ'D.)
	A515-00021-0000	MULTIFUNCTION SWITCH BRKT. ASSY.
	3010-03003-0000	GROUNDING CLIP

NO. 580 — SOLAR FOX — COCKTAIL — FRONT

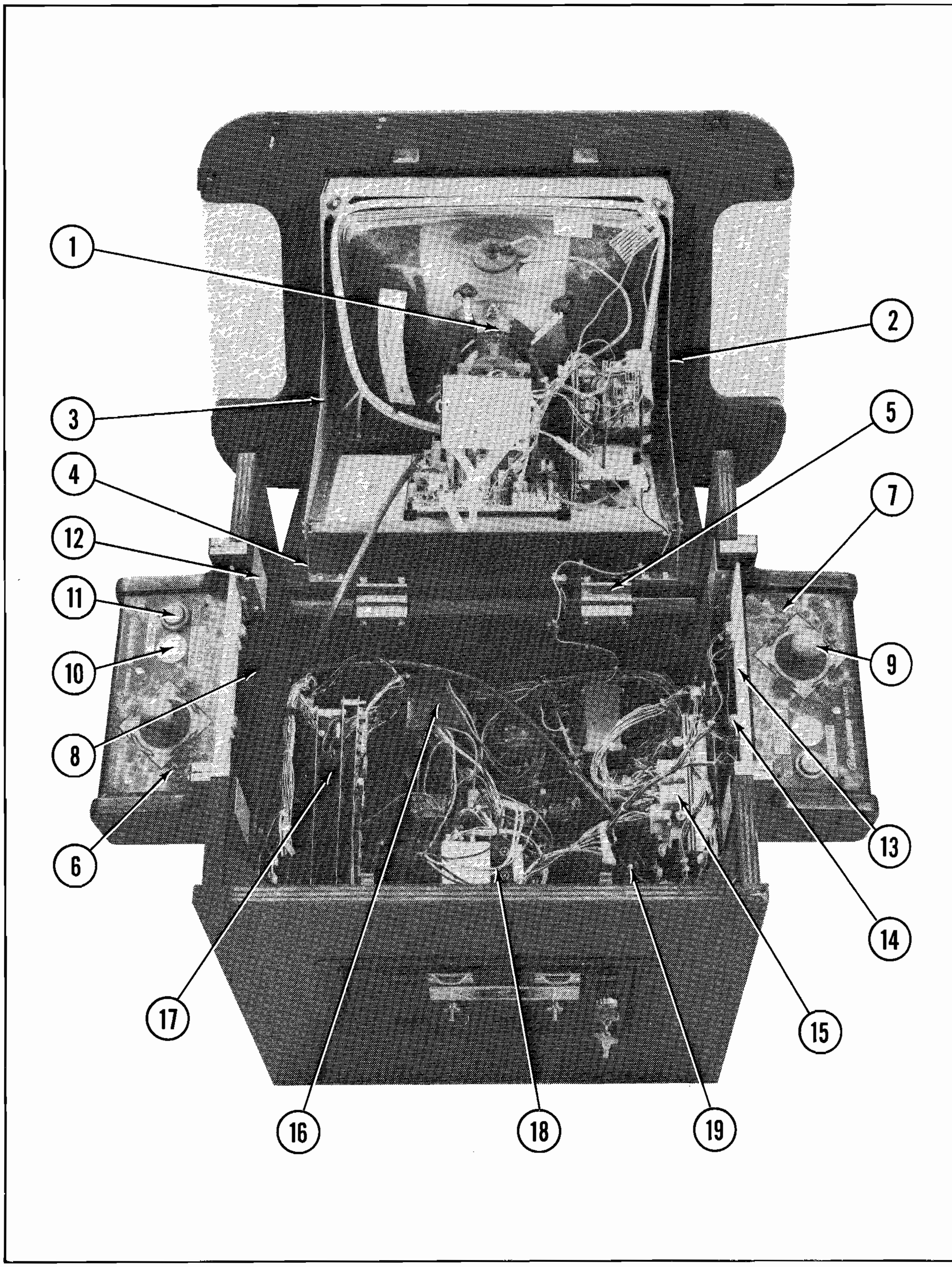


NO. 580 — SOLAR FOX — COCKTAIL — FRONT — PARTS LIST

*ORDER BY PART NUMBER **ONLY***

ITEM	PART NO.	DESCRIPTION
1	0017-00009-0499	COVER GLASS — 32" x 22" x 1/4"
	0580-00901-0000	ARTWORK UNDERLAY
2	0775-00104-00XF	GLASS CLIPS (8 REQ'D.)
	0017-00101-0117	#8 x 5/8 PHIL. TRS. HD. SCREW (16 REQ'D.)
3	0557-00900-0000	T.V. BEZEL
	0508-00905-0000	SMOKED PLEXI — 17-3/8" x 13-1/4" x 1/8"
4	A580-00004-0100	CONTROL SHELF ASSY. — PLAYER 1
5	A580-00004-0200	CONTROL SHELF ASSY. — PLAYER 2
6	0017-00009-0393	BLACK SPEAKER GRILLE W/SLOTS (2 REQ'D.)
7	0017-00009-0482	SPEAKER GRILLE — SMALL (2 REQ'D.)
	0017-00003-0431	4" SQR. SPEAKER — 4 OHM, 10W. (2 REQ'D.)
	0017-00101-0136	#8-32 x 1-1/4 CARRIAGE BOLT (16 REQ'D.)
	0017-00103-0061	#8-32 HEX NUT W/SEMS (16 REQ'D.)
8	A090-00300-11BK	U.S.A. 25¢ COIN DOOR
9	0090-00002-02BK	LARGE COIN DOOR FRAME
	0017-00101-0121	#6-32 x 5/16 PHIL. TRS. HD. SCREW (3 REQ'D.) (MOUNTS COIN DOOR TO FRAME)
10	0017-00102-0048	3/8-16 x 2" LEG LEVELERS (4 REQ'D.)
	0017-00103-0026	3/8-16 LEG LEVELER NUTS (4 REQ'D.)

NO. 580 - SOLAR FOX — COCKTAIL — INTERIOR ACCESS



NO. 580 — SOLAR FOX — COCKTAIL — INTERIOR ACCESS — PARTS LIST

*ORDER BY PART NUMBER **ONLY***

ITEM	PART NO.	DESCRIPTION
1	0017-00003-0339	ELECTROHOME — 19" COLOR DUAL SYNC. HORIZ. MTG. MONITOR (OR)
1	0017-00003-0439	WELLS GARDNER — 19" COLOR DUAL SYNC. HORIZ. MTG. MONITOR
2	A515-00019-0000	MONITOR SUPPORT ASSY. — LEFT
3	A515-00019-0100	MONITOR SUPPORT ASSY. — RIGHT
	0017-00101-0109	#8 x 5/16 UNSLOT. HEX HD. BOLT (6 REQ'D.)
4	0927-00101-00XF	SUPPORT ANGLE (2 REQ'D.)
	0017-00101-0598	#8-32 x 5/16 SLT. HEX HD. SCREW (4 REQ'D.)
5	0017-00009-0514	2-1/2" HINGE (2 REQ'D.)
	0017-00101-0639	#8-32 x 1-1/4" CARRIAGE BOLT (4 REQ'D.)
	0017-00101-0628	#8-32 x 3/4" CARRIAGE BOLT (4 REQ'D.)
	0017-00103-0061	#8-32 HEX NUT W/SEMS (8 REQ'D.)
6	0580-00900-0100	DECORATIVE OVERLAY — PLAYER 1
7	0580-00900-0200	DECORATIVE OVERLAY — PLAYER 2
	0580-00100-00XF	CONTROL PANEL (2 REQ'D.)
	0017-00101-0620	#8-32 x 1/2 CARRIAGE BOLT (8 REQ'D.)
	0017-00103-0061	#8-32 HEX NUT W/SEMS (8 REQ'D.)
	0017-00101-0341	#6 x 1/4 PHIL. TRS. HD. SCREW (10 REQ'D.)
8	0510-00101-00XF	BOTTOM PAN (2 REQ'D.)
9	A580-00015-0000	CONTROL ASSY. (2 REQ'D.)
10	0017-00042-0301	YELLOW PUSH BUTTON ASSY. (2 REQ'D.)
11	0017-00042-0304	RED PUSH BUTTON ASSY. (2 REQ'D.)
	0017-00032-0093	PUSH BUTTON SWITCH W/HOLDER (4 REQ'D.)
	0017-00103-0054	5/8-11 PAL NUT (4 REQ'D.)
12	0930-00104-0000	CONTROL PANEL LOCATING BRKT. (4 REQ'D.)
	0017-00101-0025	#8 x 1/2" SLT. HEX HD. SCREW (16 REQ'D.)
13	0727-00901-0000	LIGHT SHIELD (2 REQ'D.)
14	0017-00031-0044	WEDGE BASE LAMP SOCKET (4 REQ'D.)
	0017-00003-0219	#194 LAMP 14V., .27A (4 REQ'D.)
	0017-00101-0555	#6-32 x 5/16" SLT. HEX HD. SCREW (4 REQ'D.)
15	A082-90412-D000	125VA. POWER SUPPLY P.C. ASSY.
	0624-00902-0500	P.C. SUPPORT BRKT. 6-1/2" LG. (4 REQ'D.)
16	A580-00007-0000	TRANSFORMER BOARD ASSY.
17	A580-00013-0000	CARD RACK W/BOARDS ASSY.
	A084-90009-A580	CPU BOARD ASSY.
	A084-90908-B982	SOUND BOARD ASSY.
	A084-91399-A580	VIDEO GENERATOR P.C. ASSY.
	A968-00018-0000	SUPPORT BRKT. ASSY. — TOP
	0968-00511-0000	CARD SUPPORT BASE — BOTTOM
18	A945-00002-0000	125VA. FILTER ASSY.
19	A775-00013-0000	FAN ASSEMBLY
	0151-00081-0000	4" FAN
	0775-00110-00XF	FAN PLATE
	0749-00106-00XF	VENT SCREEN
	0017-00101-0347	#6-32 x 1/2" R.H.M.S. (4 REQ'D.)
	0017-00104-0009	#6 EXT. WASHER (4 REQ'D.)
	0017-00103-0005	#6-32 HEX NUT (4 REQ'D.)
	0017-00101-0026	#8 x 5/8 SLT. HEX HD. SCREW (4 REQ'D.)

NO. 580 — SOLAR FOX — COCKTAIL — INTERIOR ACCESS — PARTS LIST (Continued)

ORDER BY PART NUMBER ***ONLY***

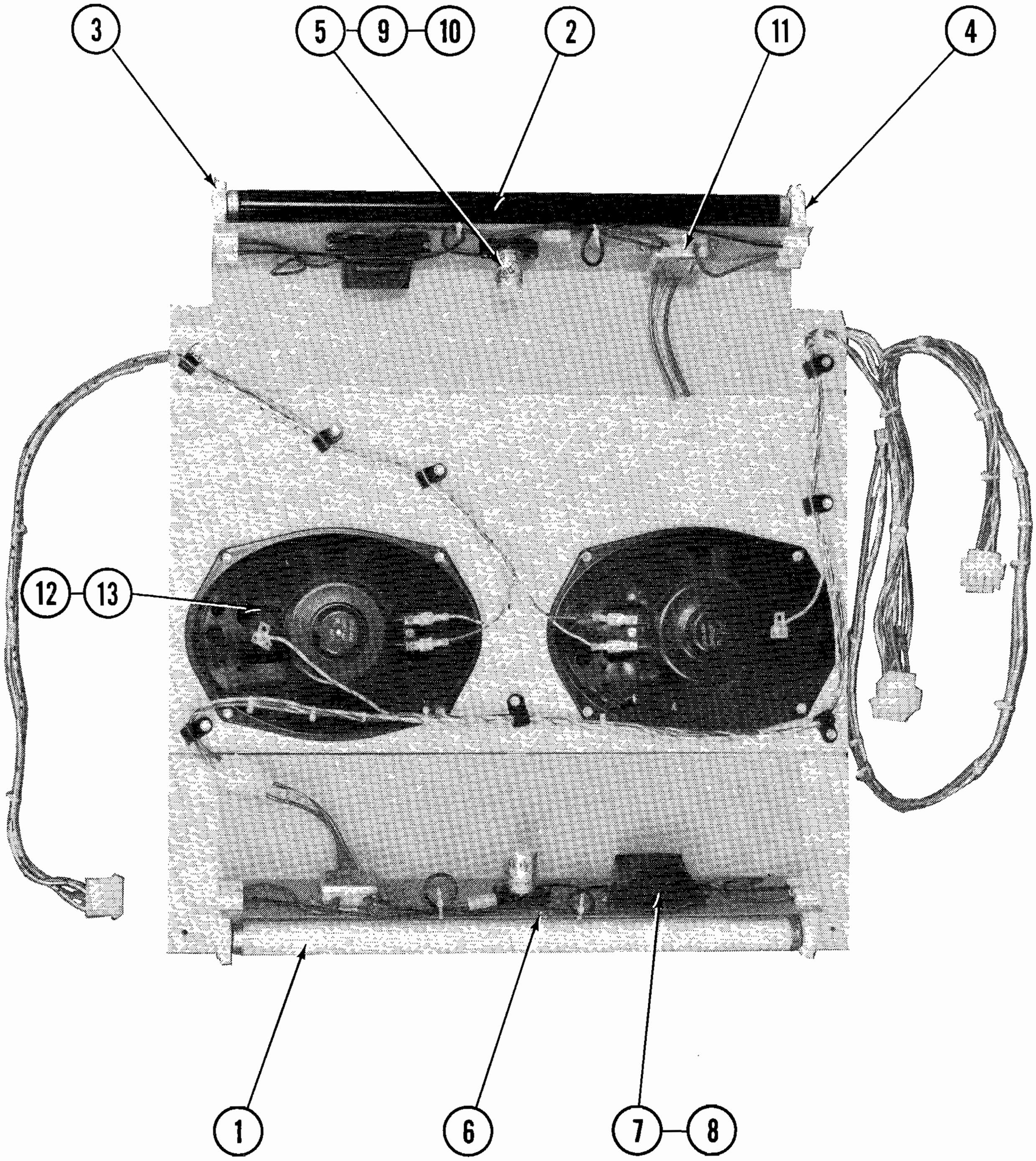
ITEM	PART NO.	DESCRIPTION
		ADDITIONAL PARTS LIST
	A082-90910-E000	DUAL POWER AMP P.C. ASSY.
	A088-00014-0000	INTERLOCK SWITCH & BRKT. ASSY.
	A515-00021-0000	MULTIFUNCTION SWITCH BRKT. ASSY.
	A088-00013-0000	ON/OFF SWITCH & BRKT. ASSY.
	0610-00132-00ZN	STRIKE (2 REQ'D.)
	0017-00009-0033	LATCH CLAMP (2 REQ'D.)
	0017-00101-0141	#8 x 11/16 UNSLOT HEX HD. SCREW (8 REQ'D.)
	A927-00019-0000	COIN BOX ASSY.
	A962-00004-0000	COIN BOX COVER ASSY.
	A962-00005-0000	COIN BOX SIDE CHANNEL ASSY. — SHORT
	0962-00101-0000	COIN BOX SIDE CHANNEL — SHORT
	0017-00101-0628	#8-32 x 3/4 CARRIAGE BOLT (4 REQ'D.)
	0017-00104-0022	#8 WASHER (4 REQ'D.)
	0017-00103-0061	#8-32 HEX NUT W/SEMS (4 REQ'D.)
	A580-00010-0000	MASTER CABLE ASSY.
	A580-00008-0000	HIGH VOLTAGE CABLE ASSY.
	A580-00009-0000	LOW VOLTAGE CABLE ASSY.
	A580-00005-0100	CONTROL SHELF CABLE ASSY. — PLAYER 1
	A580-00005-0200	CONTROL SHELF CABLE ASSY. — PLAYER 2
	A580-00011-0000	VIDEO SIGNAL CABLE ASSY.
	A982-00015-0000	COIN DOOR CABLE ASSY.
	A927-00005-0000	LEG KIT ASSY. (HIGH BASE) — OPTIONAL (INCLUDES 4 LEGS & HARDWARE)
	A508-00023-0000	LINE CORD ASSY.

SOLAR FOX — UPRIGHT — SPEAKER BOARD ASSY. — PARTS LIST

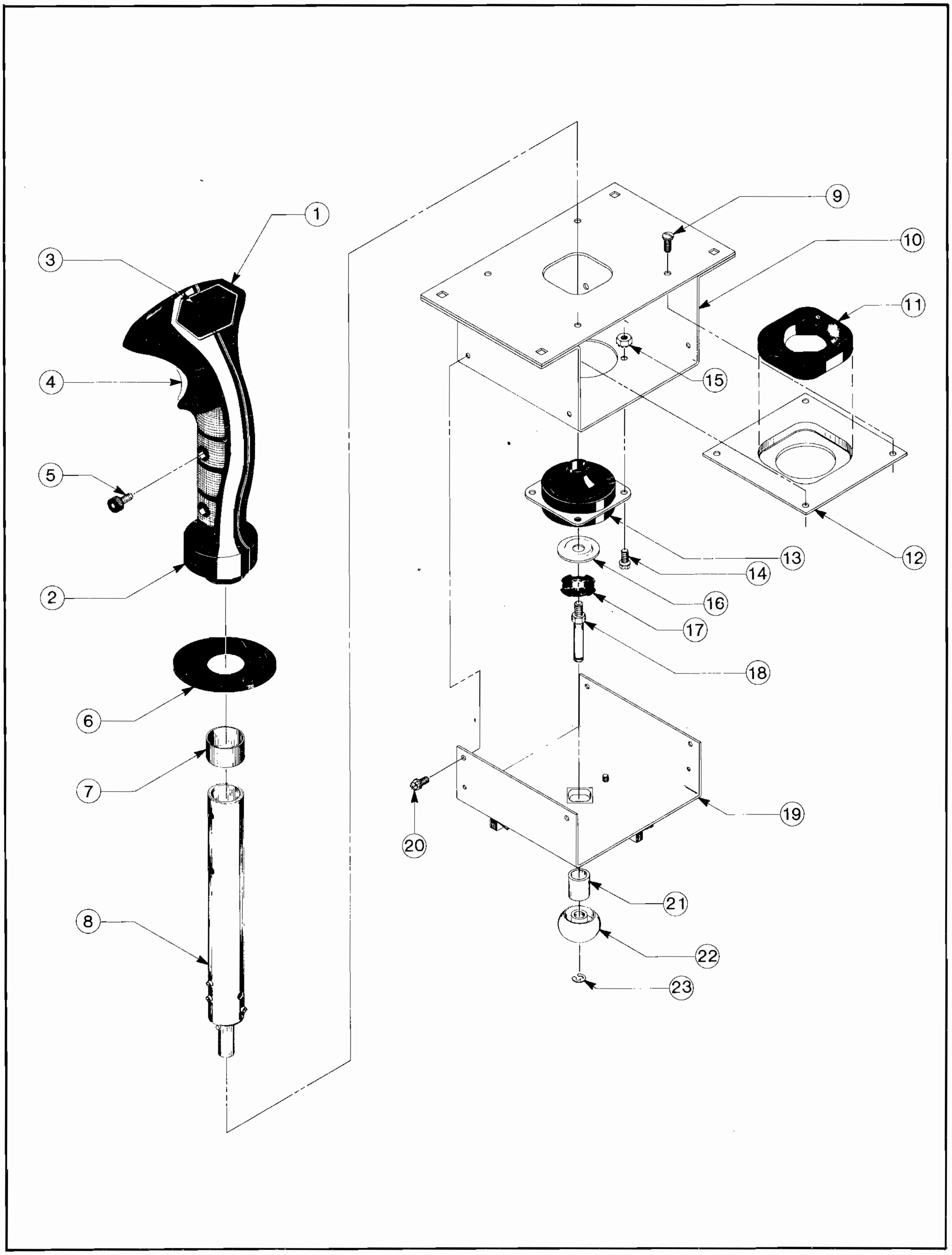
ORDER BY PART NUMBER ***ONLY***

ITEM	PART NO.	DESCRIPTION
1	0017-00003-0043	18" FLUORESCENT LAMP — COOL WHITE
2	0017-00003-0095	18" BLACK LIGHT
3	0017-00003-0445	FLUORESCENT LOCKS (4 REQ'D.)
4	0017-00031-0036	FLUORESCENT SOCKET (4 REQ'D.)
5	0017-00101-0573	#6-32 x 1/2 SLT. RND. HD. SCREW (8 REQ'D.)
6	0595-00105-0000	FLUORESCENT BRKT. (2 REQ'D.)
7	0017-00003-0026	BALLAST (2 REQ'D.)
8	0017-00101-0598	#8-32 x 5/16 SLT. HEX HD. SCREW (8 REQ'D.)
9	0017-00003-0019	STARTER (2 REQ'D.)
10	0017-00003-0412	STARTER HOLDER (2 REQ'D.)
11	A961-00042-0000	LINE FILTER ASSY. (2 REQ'D.)
12	0017-00003-0430	6" x 9" SPEAKER 4 OHM, 10W (2 REQ'D.)
13	0017-00101-0141	#8 x 11/16 UNSLOT. HEX HD. SCREW (8 REQ'D.)
	A982-00022-0000	A.C. ADAPTOR CABLE ASSY.
	A982-00023-0000	SPEAKER CABLE ASSY.
	A508-00017-0000	FLUORESCENT CABLE ASSY.
	A508-00027-0000	FLUORESCENT CABLE ASSY. — BLACK LIGHT

SOLAR FOX — UPRIGHT — SPEAKER BOARD ASSY.



SOLAR FOX — UPRIGHT — CONTROL GRIP ASSY.

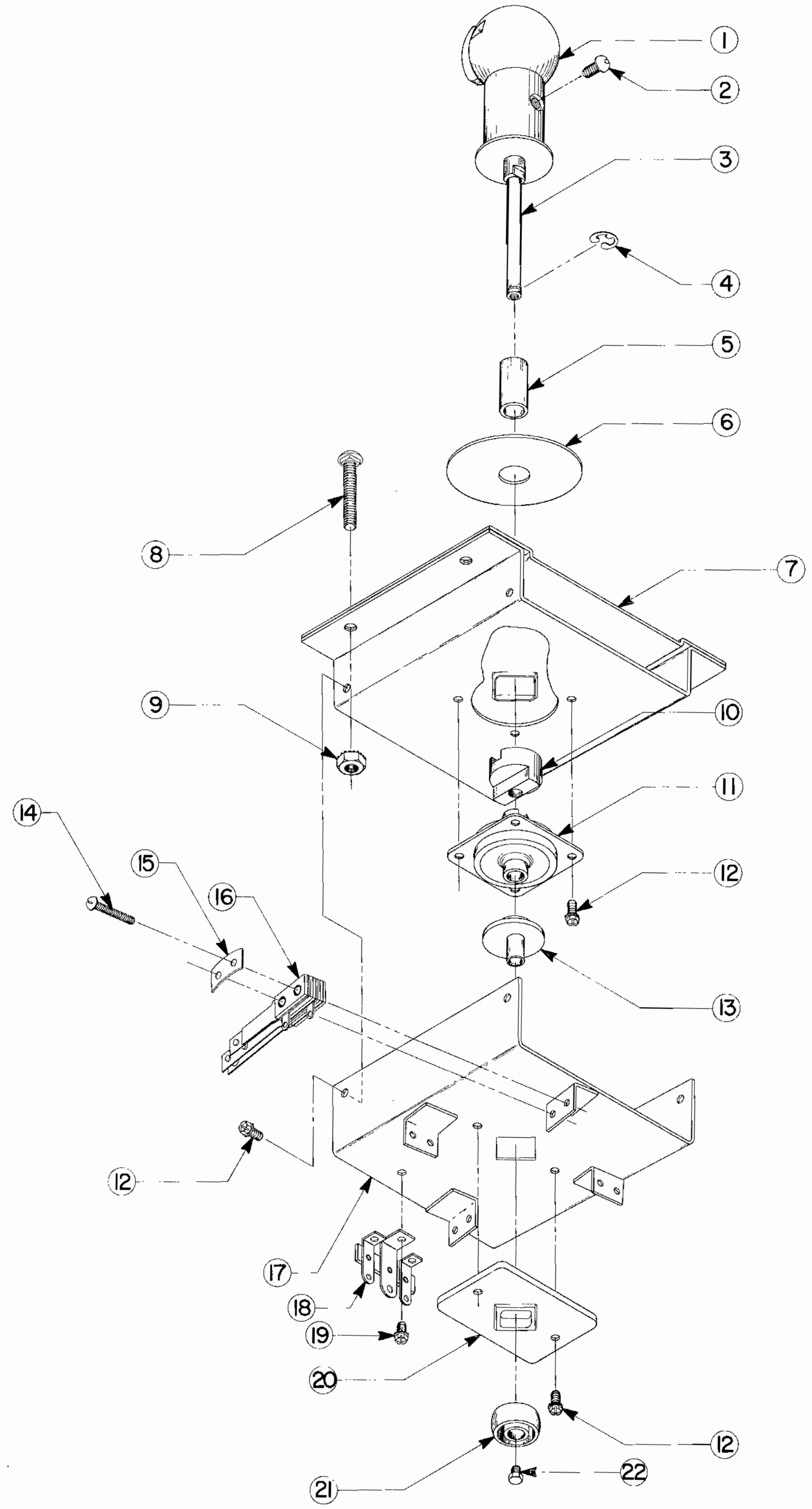


SOLAR FOX — UPRIGHT — CONTROL GRIP ASSY. — PARTS LIST

ORDER BY PART NUMBER ***ONLY***

ITEM	PART NO.	DESCRIPTION
1	0873-00900-0200	CONTROL GRIP — LEFT
2	0873-00900-0100	CONTROL GRIP — RIGHT
3	0873-00902-0000	LENS
4	0628-00906-0000	TRIGGER
	A628-00028-0000	CONTROL GRIP SWITCH ASSY.
	0020-00202-0000	SWITCH PLATE
	0017-00101-0528	#5-40 x 3/4 SLT. RND. HD. M.S. (2 REQ'D.)
	0873-00123-00XF	SWITCH MTG. BRKT.
	0017-00101-0083	#4-20 x 3/8 PHIL PAN HD. SCREW (2 REQ'D.)
5	0017-00101-0116	#10-32 x 3/8 HEX BUTTON HD. SCREW (5 REQ'D.)
	0017-00009-0513	1/8" TAMPER PROOF ALLEN KEY
6	0628-00904-0000	SLIDE
7	0628-00921-0000	SLEEVE
8	A628-00024-0000	TUBING & PIVOT PIN PINNING ASSY.
9	0017-00101-0615	#8-32 x 3/8 SLT. PAN HD. M.S. (4 REQ'D.)
10	A982-00029-0000	CENTERING BRKT. WELD ASSY.
11	0628-00909-0000	BUMPER
12	0873-00113-00XF	BUMPER MTG. BRKT.
13	0982-00908-0000	GROMMET — MODIFIED
14	0017-00101-0799	#10-32 x 3/8 SLT. HEX HD. SCREW (4 REQ'D.)
15	0017-00103-0081	#10-32 HEX NUT W/SEMS (4 REQ'D.)
16	0628-00922-0000	SHOULDER WASHER
17	0017-00104-0014	DISH WASHER
18	0628-00700-00XF	ACTUATING PIN
19	A628-00031-0000	STOP PLATE & SWITCH BRKT. ASSY.
20	0017-00101-0598	#8-32 x 5/16 SLT. HEX HD. SCREW (4 REQ'D.)
21	0628-00920-0000	ROLLER
22	0921-00700-0000	ACTUATOR
23	0017-00100-0025	1/4" E-RING

SOLAR FOX — CONTROL ASSEMBLY — COCKTAIL & MINI

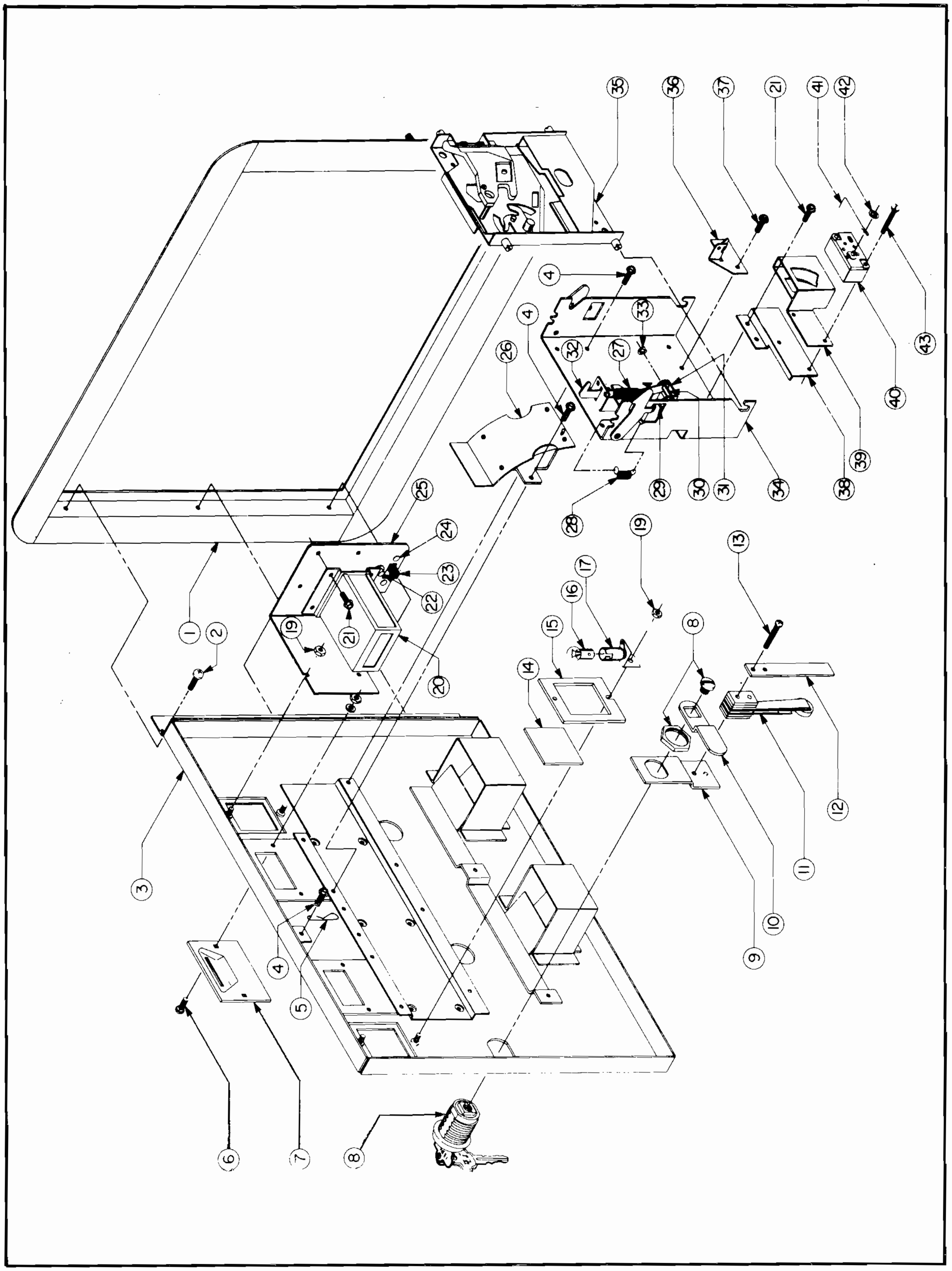


SOLAR FOX — CONTROL ASSEMBLY — COCKTAIL & MINI PARTS LIST

ORDER BY PART NUMBER ***ONLY***

ITEM	PART NO.	DESCRIPTION
1	A727-00020-0000	KNOB & SWITCH ASSY.
	0010-00267-0000	COMPRESSION SPRING
	0017-00032-0103	SWITCH
2	0017-00101-0148	#8-32 x 1/4 TAMPER RESISTANT TORX SCREW (2 REQ'D.)
3	0727-00703-00XF	SHAFT
4	0017-00100-0025	1/4" E-RING
5	0578-00903-0000	SLEEVE
6	0921-00902-0000	SLIDE PLATE
7	A595-00006-0000	PIVOT PLATE WELD ASSY.
8	0017-00101-0637	#8-32 x 1" CARRIAGE BOLT (4 REQ'D.)
9	0017-00103-0061	#8-32 HEX NUT W/SEMS (4 REQ'D.)
10	0727-00700-00XF	ADAPTOR
11	0727-00907-0000	GROMMET
12	0017-00101-0598	#8-32 x 5/16 SLT. HEX HD. SCREW (10 REQ'D.)
13	0962-00904-0000	SLEEVE
14	0017-00101-0527	#5-40 x 5/8 SLT. RND. HD. SCR. (8 REQ'D.)
15	0020-00202-0000	SWITCH PLATE (4 REQ'D.)
16	A932-00009-0000	SWITCH ASSEMBLY (4 REQ'D.)
17	A932-00012-00XF	STOP PLATE & SWITCH BRKT. ASSY.
18	0017-00021-0634	2 POSITION TERMINAL STRIP
19	0017-00101-0107	#6 x 5/16 SLT. HEX HD. SCREW
20	0932-00905-0000	WEAR PLATE
21	0921-00700-0000	ACTUATOR
22	0727-00704-0000	END GROMMET

FRONT DOOR ASSEMBLY — U.S.A. 25¢

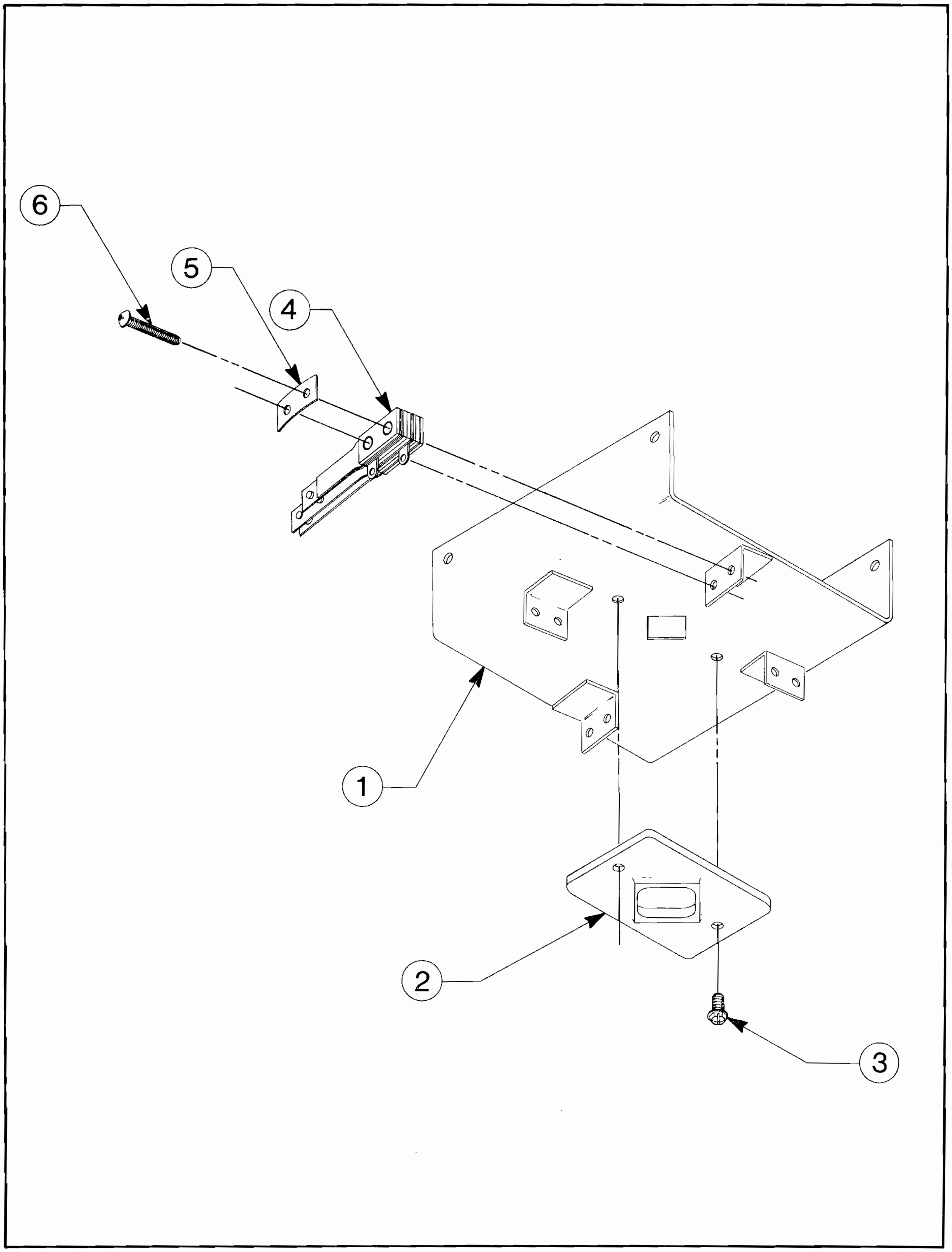


FRONT DOOR ASSEMBLY — U.S.A. 25¢

*ORDER BY PART NUMBER **ONLY***

ITEM	PART NO.	DESCRIPTION
1	0090-00002-02BK	DOUBLE ENTRY COIN DOOR FRAME
2	0017-00101-0121	#6-32 x 5/16 PHIL. TRS. HD. SCR. (3 REQ'D.)
3	A090-00073-02BK	DOUBLE ENTRY COIN DOOR W/DRESS PLATE
4	0017-00101-0123	#8 x 1/4 UNSLOT. HEX HD. SCREW (4 REQ'D.)
5	0017-00007-0019	KEY HOOK
6	0017-00101-0552	#6-32 x 1/4 CARRIAGE BOLT (4 REQ'D.)
7	0090-00117-03XF	COIN ENTRY PLATE — 25¢ (2 REQ'D.)
8	A097-00005-0000	DOOR LOCK & KEY W/SCREW & NUT (OR)
8	A097-00006-0000	DOOR LOCK & KEY W/SCREW & NUT
9	0090-00128-00XF	DOOR TILT SWITCH BRKT.
10	0017-00005-0041	DOOR CAM
11	A090-00096-0000	DOOR TILT SWITCH
12	0090-00126-01XF	SWITCH BACK-UP PLATE
13	0017-00101-0525	#5-40 x 9/16" PHIL. HD. M.S. (2 REQ'D.)
	A090-00096-0000	DOOR TILT SWITCH & BRKT. ASSY. (ITEMS 9 & 11 THRU 13)
14	0090-00903-9500	25¢ WINDOW (2 REQ'D.)
15	0090-00143-00XF	COIN PLEX RETAINER
16	0017-00003-0219	12 VOLT LAMP — G.E. #194 (2 REQ'D.)
17	0017-00031-0048	WEDGE SOCKET W/BRKT. (2 REQ'D.)
19	0017-00103-0084	#6-32 HEX NUT W/SEMS (4 REQ'D.)
20	A090-00089-0000	COIN METER W/DIODE
21	0017-00101-0124	#6 x 1/4 UNSLOT. HEX HD. SCR. (8 REQ'D.)
22	0017-00032-0051	PUSH BUTTON SWITCH
23	0017-00032-0007	SLIDE SWITCH
24	0017-00072-0034	STEEL OVAL HD. RIVET
25	0090-00173-0000	COIN COUNTER MTG. BRKT.
	A090-00082-0100	TEST SWITCH & BRKT. ASSY. (ITEMS 23 THRU 25)
26	A090-00087-0000	COIN CHUTE & TOP ASSY. (2 REQ'D.)
27	0010-00134-0000	SPRING
28	0010-00181-0000	SPRING
29	0017-00007-0083	1/8 x 1-5/8 ROLL PIN
30	0090-00129-00XF	PIVOT POST
31	0090-00167-00XF	PIVOT LEVER
32	0093-00155-00XF	REJECT LEVER
33	0017-00100-0018	E-RING
	A090-00088-0000	REJECT LEVER ASSY. (2 REQ'D.) (ITEMS 30 THRU 33)
34	A090-00085-0000	COIN ACCEPTOR FRAME ASSY. (2 REQ'D.)
35	0017-00005-0003	COIN ACCEPTOR W/STRING CUTTER (2 REQ'D.) (OR)
35	0017-00005-0211	COIN ACCEPTOR W/ANTI STRING DEVICE (2 REQ'D.) (OR)
35	0017-00005-0214	COIN ACCEPTOR W/STRING CUTTER (2 REQ'D.)
36	A090-00064-0000	ANTI-PENNY DEVICE
37	0017-00101-0099	#6 x 1/4 SLT. HEX HD. M.S. (2 REQ'D.)
38	0090-00162-00XF	COIN SWITCH MTG. BRKT.
39	0017-00005-0203	COIN SWITCH CHUTE
40	0017-00005-0195	COIN SWITCH
41	0010-00599-0000	COIN SWITCH WIRE
42	0017-00007-0132	PUSH-ON RING
	A090-00059-0400	COIN SWITCH & WIRE ASSY. (ITEMS 40 THRU 42)
43	0017-00101-0698	#4-40 x 3/4 SLT. RND. HD. M.S. (2 REQ'D.)
	A090-00077-0000	COIN GUIDE & SWITCH ASSY. (ITEMS 38 THRU 43)

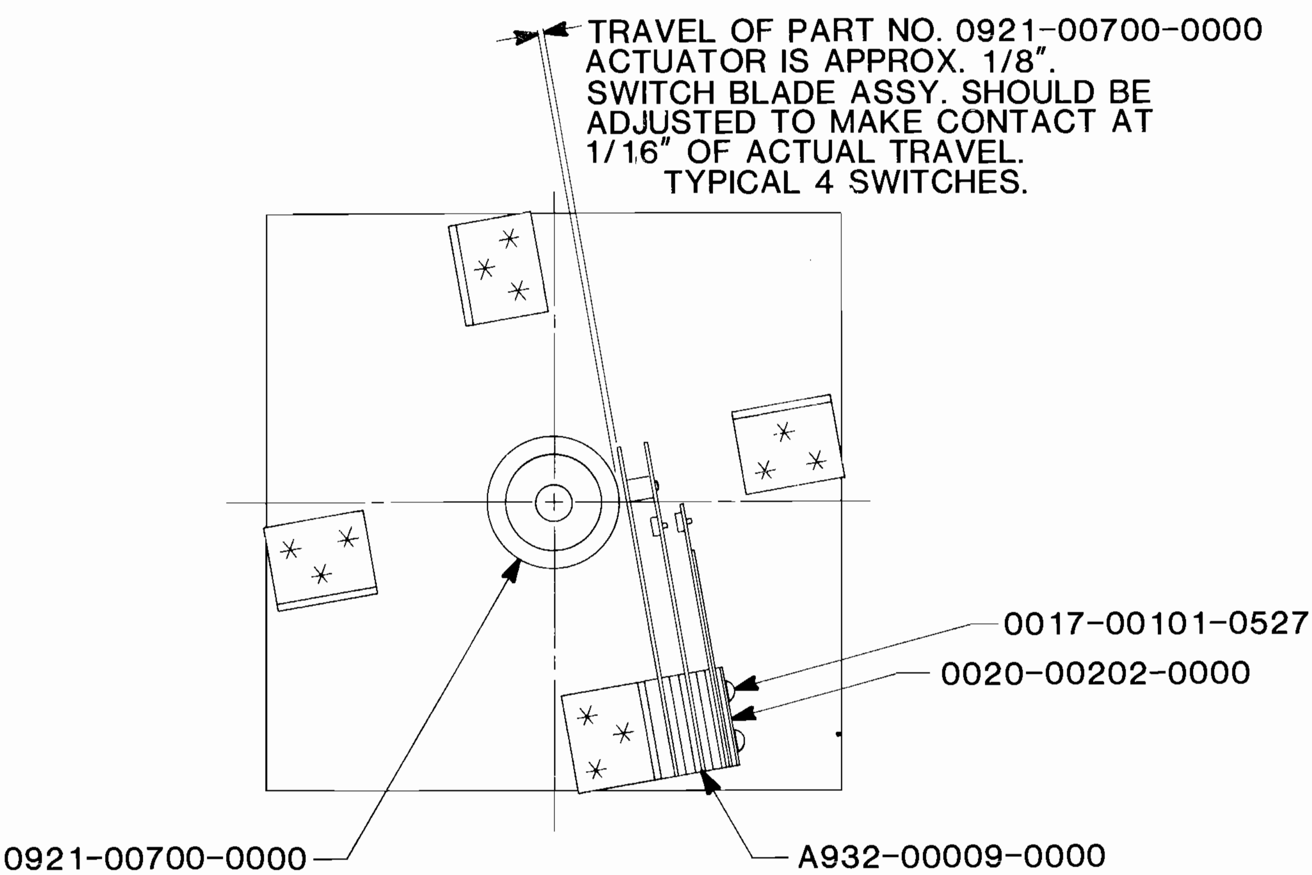
SOLAR FOX — ALL VERSIONS — CONTROL SWITCH ASSY.



SOLAR FOX — ALL VERSIONS — CONTROL SWITCH ASSY. — PARTS LIST

ORDER BY PART NUMBER ***ONLY***

ITEM	PART NO.	DESCRIPTION
1	A628-00031-0000	STOP PLATE & SWITCH BRKT.
2	0932-00905-0000	WEAR PLATE
3	0017-00101-0598	#8-32 x 5/16 SLT. HEX. HD. SCREW (2 REQ'D.)
4	A932-00009-0000	SWITCH ASSY. (4 REQ'D.)
5	0020-00202-0000	SWITCH PLATE (4 REQ'D.)
6	0017-00101-0527	#5-40 x 5/8 SLT. RND. HD. M.S. (8 REQ'D.)



VI Technical Troubleshooting

Introduction

The most common problems occur in harness components such as the coin acceptor, player controls, interconnecting wiring, etc. The TV monitor and PCB computer cause their share of problems too, but not as much as the harness and its component parts. TV monitor troubleshooting will not be covered here because it is covered in that section of this manual.

As you already know, the PCB computer is a complex device with a number of different circuits. Some circuits remain basically the same among games, but overall there are a great many differences between them. PCB troubleshooting procedures, therefore, can be lengthy and will differ greatly among games. However, some basic Z-80 CPU information is involved in this section.

General Suggestions

The first step in any troubleshooting procedure is correctly identifying the malfunction's symptoms. This includes not only the circuits or features malfunctioning, but also those still operational. A carefully trained eye will pick up other clues as well. For instance, a game in which the computer functions fail completely just after money was collected may have a quarter shorting the PCB traces. Often, an experienced troubleshooter will be able to spot the cause of the problem even before opening the cabinet.

After all the clues are carefully considered, the possible malfunctioning areas can be narrowed down to one or two good suspects. Those areas can be examined by a process of elimination until the cause of the malfunction is discovered.

Harness Component Troubleshooting

Typical problems falling in this category are coin and credit problems, power problems and failure of individual features.

NO GAME CREDIT

For example, your prospective player inserts his quarter and is not awarded a game. The first item to check is if the quarter is returned. If the quarter is returned, the malfunction most certainly lies in the coin acceptor itself. First, use a set of test coins (both old and new) to ascertain that the player's coin is not undersize or underweight. If your test coins are also returned, coin acceptor servicing is indicated. Generally, the cause of this particular problem is a maladjusted magnet gate. Normally, this will mean slightly closing the magnet gate a little by turning the adjusting screw out a bit (see section on coin acceptor for more details).

If the quarter is not returned and there is no game credit, the cause of the malfunction may be in one of several areas. First try operating the coin return button; if the coin is returned, the problem is most likely in the magnet gate. Enlarge the gap according to the coin acceptor service procedures. If this does not cure the problem, remove the coin acceptor, clean it and perform the major adjustment procedure.

If the trapped coin is not returned when the wiper lever is actuated, you may have an acceptor jammed by a slug, gummed up with beer, a jammed coin chute, or mechanical failure of the acceptor mechanism. In this case, first check for the slug that will generally be trapped against the magnet. If so, simply remove the slug and test the acceptor. If the chute is blocked, remove the acceptor and remove the jammed coins. If there is actual failure of the acceptor, remove the unit and repair as indicated in the coin acceptor service procedures.

If the coin is making its way through the acceptor (that is, falling into the coin box), yet there is still no game credit, you either have a mechanical failure of the coin switch or electrical failure of the coin and credit circuits. The first place to begin is by checking the coin switch. Most of these switches are the make/break variety of micro switch, which is checked by testing for continuity between the NO, NC, and C terminals. When not actuated, the NC and C terminals should be continuous and the NO terminal open. When operated, the NO and C terminals should close and the NC should be open. If the coin switch checks out, examine the connections to the terminals to make sure there is good contact. If necessary, use the continuity tester and check from the terminal lug on the switch to the associated PCB trace. This will tell you if there is a continuous line all the way to the credit circuit.

If the coin switch wires do not check out, the problem is in the computer — most likely in the coin and credit circuitry.

If you do get game credit when a coin is deposited, but the game will not start when the start switch is pressed, you may have a problem in the start switch, the interconnecting wiring or in the computer. First check the switch. If the switch is OK, proceed to check the wiring. Again, make sure you go from the terminal lug on the switch to the PCB trace. This way, you will check the terminal contact as well as PCB edge connector contact. If the wiring is continuous, proceed to check the PCB credit circuit. If not, check each section of the wiring, until the discontinuity is located. If the wiring is OK, the problem must lie in the computer.

Transformer and Line Voltage Problems

Your machine must have the correct line voltage to operate properly. If the line voltage drops too low, a circuit in the computer will disable game credit. The point at which the computer will fail to work will vary some from game to game, but no game will work on line voltage that drops below 105 VAC.

Low line voltage may have many causes. Line voltage normally fluctuates a certain amount during the day as the total usage varies. Peak usage times occur mainly at dawn or dusk, so if your machine's malfunction seems to be related to the time of day, this may be a factor. A large load connected to the same line as the game (such as a large air conditioner or other device with an exceptionally large motor) may drop the line voltage significantly when starting up. This drop can result in an intermittent credit problem. In addition, poor connections in the location wiring, plug, or line cord may also cause a significant drop in power. Cold solder joints in the game's harness, especially in areas like the transformer connections, interlock switch, or fuse block, may also produce the same results, although probably on a more permanent basis.

Sometimes location owners (especially in bars) replace light switches with dimmer rheostats, and the game is sometimes on the same line. Obviously, the voltage available to the game is going to drop dramatically when the dimmer is turned.

In any case, the way to check for correct line voltage is with your VOM. Set the VOM to 250 VAC and stick the probes in the wall receptacle. If it's OK here, check the transformer primary connections. If you do not get 117 VAC, examine the solder joints on the transformer, fuse block, and interlock switch. If you do get 117 VAC, the problem must be either in the transformer, harness connections, or in the PCB power supply.

If you suspect the transformer, check its secondaries with the VOM set to 50 VAC and correlate the readings with the legend on the side of the transformer. The transformer must also be correctly grounded, so check the ground potential as well, especially if there is a hum bar rolling up or down the TV screen.

HARNESS PROBLEMS

Other harness problems include blowing fuses and malfunctioning controls. The repeating blown-fuse problem can sometimes be quite exasperating to solve, for short circuits have the tendency to occur in areas almost impossible to find. First, try inserting a new fuse, as old fuses age and blow without cause. If the new one also blows, you definitely have a short.

The best way to approach this problem is by turning the power off and disconnecting devices that may be causing the problem, such as the TV, transformer, and PCB. Disconnect the devices by pulling off their connectors, but do not allow them to touch. If necessary, insulate them with small pieces of electrical tape. Then, connect your VOM across the terminals of the fuse block (all electrical power shut off), and set it to one of the resistance scales. This will save blowing a fuse each time you want to check the circuit.

If the VOM reveals that disconnecting the devices removed the short, reconnect the devices one by one until the short returns. The last device connected is the one that is at fault. If the VOM reads a short even after the devices are disconnected, the fault must lie in the harness itself, and only patient exploration will reveal its location. First, carefully examine all the wiring, looking for terminals that may be touching, metal objects such as coins shorting connections or burned insulation. If necessary, use the VOM to check each suspected wire.

MALFUNCTIONING CONTROLS

One of the most common problems here is a bad potentiometer. Typically, a bad pot will cause the image to jump as it reaches a certain point. The only cure for this one is to install a new pot.

If a feature that is operated by a switch (for example, joysticks, foot pedals, control panel buttons) does not operate at all, check the switch with a VOM or continuity tester to verify its operation. If the switch does not check out, replace it. If the switch is OK, you should suspect the input to the switch from the PCB. In this case, get out the harness and logic schematics and check to see what kind of input it is. In many cases, the input will be +5 VDC. If so, use the VOM to check its presence. Normally, the switch is used to pull a +5 VDC line LOW to GND or to pull a LOW line HIGH. If the PCB output is missing, check the wire length from the PCB. If you find the signal at the PCB trace, the wire length or connection is at fault. If not, begin exploring the PCB using the logic schematics.

A Glossary of Microprocessor Terms

MICROPROCESSOR — one or several microcircuits that perform the function of a computer's CPU. Sections of the circuit have arithmetic and comparative functions that perform computations and executive instructions.

CPU — central-processing unit. A computing system's "brain", whose arithmetic, control and logic elements direct functions and perform computations. The microprocessor section of a microcomputer is on one chip or several chips.

PROM — programmable read-only memory. User permanently sets binary on-off bits in each cell by selectively fusing or not fusing electrical links. Nonerasable. Used for low-volume applications.

EPROM — erasable, programmable, read-only memory. Can be erased by ultraviolet light bath, then reprogrammed. Frequently used during design and development to get programs debugged, then replaced by ROM for mass production.

ROM — read-only memory. The program, or binary on-off bit pattern, is set into ROM during manufacture, usually as part of the last metal layer put onto the chip. Nonerasable. Typical ROM's contain up to 16,000 bits of data to serve as the microprocessor's basic instructions.

RAM — random-access memory. Stores binary bits as electrical charges in transistor memory cells. Can be read or modified through the CPU. Stores input instructions and results. Erased when power is turned off.

LSI — large scale integration. Formation of hundreds or thousands of so-called gate circuits on semiconductor chips. Very large scale integration (VLS) involves microcircuits with the greatest component density.

MOS — metal-oxide semiconductor. A layered construction technique for integrated circuits that achieves high component densities. Variations in MOS chip structures create circuits with speed and low-power requirements, or other advantages (static will damage a MOS chip).

Introduction to the Z-80 CPU

The term "microcomputer" has been used to describe virtually every type of small computing device designed within the last few years. This term has been applied to everything from simple "microprogrammed" controllers constructed out of TTL MSI up to low end minicomputers with a portion of the CPU constructed out of TTL LSI "bit slices." However, the major impact of the LSI technology within the last few years has been with MOS LSI. With this technology, it is possible to fabricate complete and very powerful computer systems with only a few MOS LSI components.

The Zilog Z-80 family of components can be configured with any type of standard semiconductor memory to generate computer systems with an extremely wide range of capabilities. For example, as few as two LSI circuits and three standard TTL MSI packages can be combined to form a simple controller. With additional memory and I/O devices a computer can be constructed with capabilities that only a minicomputer could previously deliver.

New products using the MOS LSI microcomputer are being developed at an extraordinary rate. The Zilog Z-80 component set has been designed to fit into this market through the following factors:

1. The Z-80 is fully software compatible with the popular 8080A CPU.
2. Existing designs can be easily converted to include the Z-80.
3. The Z-80 component set is at present superior in both software and hardware capabilities to any other microcomputer system on the market today.
4. For increased throughput the Z80A operating at a 4 MHZ clock rate offers the user significant speed advantages.

Microcomputer systems are extremely simple to construct using Z-80 components. Any such system consists of three parts:

1. **CPU (Central Processing Unit)**
2. **Memory**
3. **Interface Circuits to peripheral devices**

The CPU is the heart of the system. Its function is to obtain instructions from the memory and perform the desired operations. The memory is used to contain instructions and in most cases data that is to be processed. For example, a typical instruction sequence may be to read data from a specific peripheral device, store it in a location in memory, check the parity and write it out to another peripheral device. Note that the Zilog component set includes the CPU and various general purpose I/O device controllers, while a wide range of memory devices may be used from any source. Thus, all required components can be connected together in a very simple manner with virtually no other external logic.

General Purpose Registers

There are two matched sets of general purpose registers, each set containing six 8-bit registers that may be used individually as 8-bit registers or as 16-bit register pairs by the programmer. One set is called BC, DE and HL while the complementary set is called BC', DE' and HL'. At any one time the programmer can select either set of registers to work with through a single exchange command for the entire set. In systems where fast interrupt response is required, one set of general purpose registers and an accumulator/flag register may be reserved for handling this very fast routine. Only a simple exchange command need be executed to go between the routines. This greatly reduces interrupt service time by eliminating the requirement for saving and retrieving register contents in the external stack during interrupt or subroutine processing. These general purpose registers are used for a wide range of applications by the programmer. They also simplify programming, especially in ROM based systems where little external read/write memory is available.

Arithmetic & Logic Unit (ALU)

The 8-bit arithmetic and logical instructions of the CPU are executed in the ALU. Internally the ALU communicates with the registers and the external data bus on the internal data bus. The type of functions performed by the ALU include:

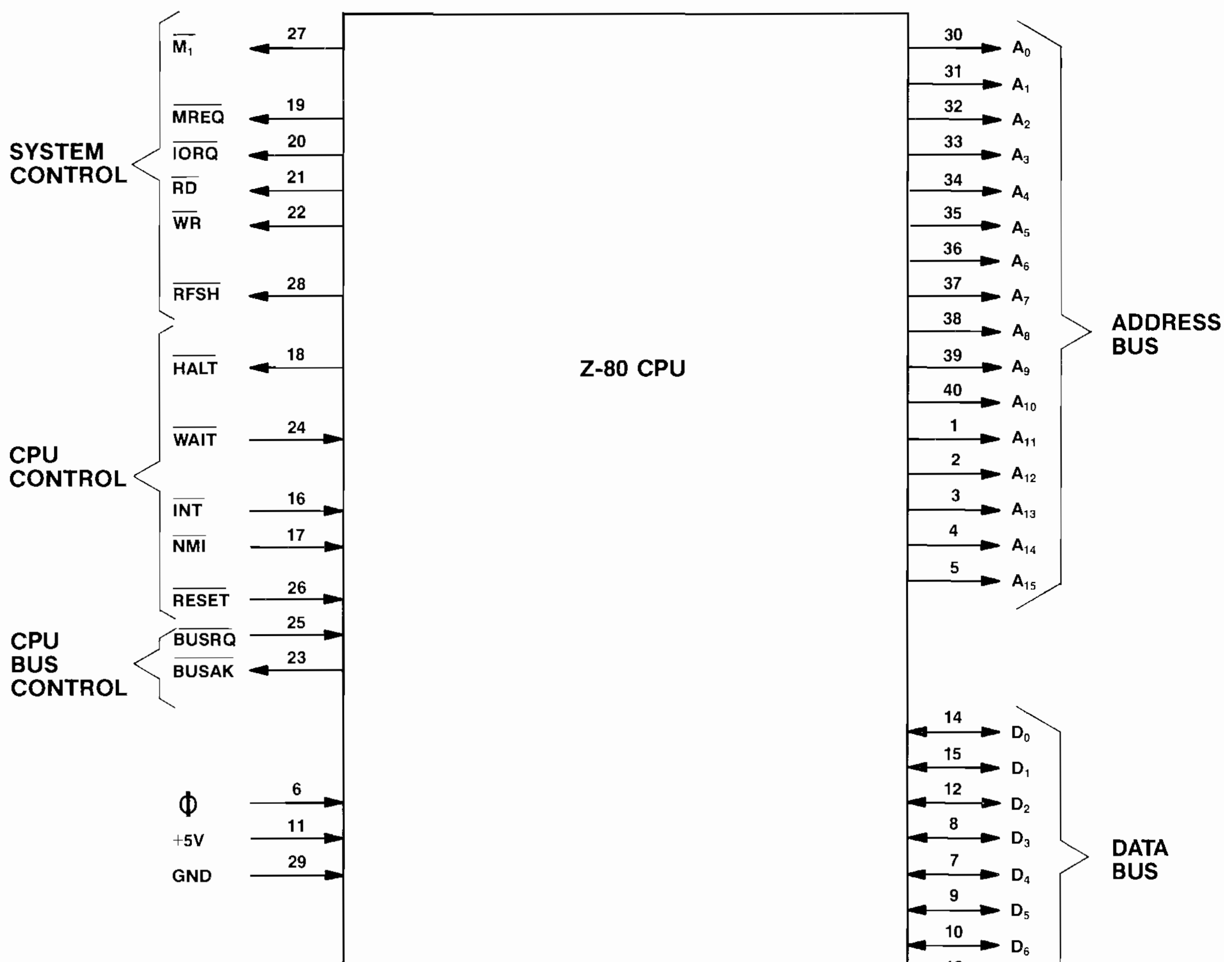
Add	Left or right shifts or rotates (arithmetic and logical)
Subtract	Increment
Logical AND	Decrement
Logical OR	Set bit
Logical Exlusive OR	Reset bit
Compare	Test bit

Instruction Register and CPU Control

As each instruction is fetched from memory, it is placed in the instruction register and decoded. The control sections performs this function and then generates and supplies all of the control signals necessary to read or write data from or to the registers, control the ALU and provide all required external control signals.

Z-80 CPU Pin Description

The Z-80 CPU is packaged in an industry standard 40 pin Dual In-Line Package. The I/O pins are shown in the below figure and the function of each is described.



Z-80 PIN CONFIGURATION

A_0-A_{15}
(Address Bus)
Tri-state output, active high. A_0-A_{15} constitute a 16-bit address bus. The address bus provides the address for memory (up to 64K bytes) data exchanges and for I/O device data exchanges. I/O addressing uses the 8 lower address bits to allow the user to directly select up to 256 input or 256 output ports. A_0 is the least significant address bit. During refresh time, the lower 7 bits contain a valid refresh address.

D_0-D_7
(Data Bus)
Tri-state input/output, active high. D_0-D_7 constitute an 8-bit bidirectional data bus. The data bus is used for data exchanges with memory and I/O devices.

M_1
(Machine Cycle one)
Output, active low. $\overline{M_1}$ indicates that the current machine cycle is the OP code fetch cycle of an instruction execution. Note that during execution of 2-byte op-codes, $\overline{M1}$ is generated as each op code byte is fetched. These two byte op-codes always begin with CBH, DDH, EDH or FDH. $\overline{M1}$ also occurs with $\overline{IORQ}$ to indicate an interrupt acknowledge cycle.

MREQ
(Memory Request)
Tri-state output, active low. The memory request signal indicates that the address bus holds a valid address for a memory read or memory write operation.

IORQ
(Input/Output Request)
Tri-state output, active low. The $\overline{IORQ}$ signal indicates that the lower half of the address bus holds a valid I/O address for a I/O read or write operation. An $\overline{IORQ}$ signal is also generated with an $\overline{M1}$ signal when an interrupt is being acknowledged to indicate that an interrupt response vector can be placed on the data bus. Interrupt Acknowledge operations occur during M_1 time while I/O operations never occur during M_1 time.

RD
(Memory Read)
Tri-state output, active low. $\overline{RD}$ indicates that the CPU wants to read data from memory or an I/O device. The addressed I/O device or memory should use this signal to gate data onto the CPU data bus.

WR
(Memory Write)
Tri-state output, active low. $\overline{WR}$ indicates that the CPU data bus holds valid data to be stored in the addressed memory or I/O device.

RFSH
(Refresh)
Output, active low. $\overline{RFSH}$ indicates that the lower 7 bits of the address bus contain a refresh address for dynamic memories and the current MREQ signal should be used to do a refresh read to all dynamic memories.

HALT
(Halt state)
Output, active low. $\overline{HALT}$ indicates that the CPU has executed a HALT software instruction and is awaiting either a non maskable or a maskable interrupt (with the mask enabled) before operation can resume. While halted, the CPU executes NOP's to maintain memory refresh activity.

WAIT
(Wait)
Input, active low. $\overline{WAIT}$ indicates to the Z-80 CPU that the addressed memory or I/O devices are not ready for a data transfer. The CPU continues to enter wait states for as long as this signal is active. This signal allows memory or I/O devices of any speed to be synchronized to the CPU.

INT
(Interrupt Request)
Input, active low. The Interrupt Request signal is generated by I/O devices. A request will be honored at the end of the current instruction if the internal software controlled interrupt enable flip-flop (IFF) is enabled and if the $\overline{BUSRQ}$ signal is not active. When the CPU accepts the interrupt, an acknowledge signal ($\overline{IORQ}$ during M_1 time) is sent out at the beginning of the next instruction cycle. The CPU can respond to an interrupt in three different modes that are described in detail in section 5.4 (CPU Control Instructions).

NMI
(Non-Maskable Interrupt)
Input, negative edge triggered. The non maskable interrupt request line has a higher priority than $\overline{INT}$ and is always recognized at the end of the current instruction, independent of the status of the interrupt enable flip-flop. $\overline{NMI}$ automatically forces the Z-80 CPU to restart to location 0066H. The program counter is automatically saved in the external stack so that the user can return to the program that was interrupted. Note that continuous $\overline{WAIT}$ cycles can prevent the current instruction from ending, and that a $\overline{BUSRQ}$ will override a $\overline{NMI}$.

RESET
Input, active low. RESET forces the program counter to zero and initializes the CPU. The CPU initialization includes:

1) Disable the interrupt enable flip-flop

2) Set Register I = 00_H

3) Set Register R = 00_H

4) Set Interrupt Mode 0

During reset time, the address bus and data bus go to a high impedance state and all control ouput signals go to the inactive state.

BUSRQ
(Bus Request)
Input, active low. The bus request signal is used to request the CPU address bus, data bus and tri-state output control signals to go to a high impedance state so that other devices can control these buses. When BUSRQ is activated, the CPU will set these buses to a high impedance state as soon as the current CPU machine cycle is terminated.

BUSAK
(Bus Acknowledge)
Output, active low. Bus acknowledge is used to indicate to the requesting device that the CPU address bus, data bus and tri-state control bus signals have been set to their high impedance state and the external device can now control these signals.

CLK
(Clock)
Single phase TTL level clock which requires only a 330 ohm pull-up resistor to +5 volts to meet all clock requirements.

MCR II SYSTEM
P.C. BOARD JUMPER OPTIONS

VIDEO GENERATOR P.C. BOARD

MANUFACTURER	EPROM NO.	JW#1	JW#2	JW#3	JW#4	JW#5	JW#6	JW#7	JW#8
MOTOROLA	68764	#	*	*	#	*	*	*	*
MOTOROLA	68766	#	*	*	#	*	*	*	*
INTEL	2764	*	#	#	*	#	*	*	#
T. I.	2564	#	*	*	#	*	#	#	*

SUPER C.P.U. P.C. BOARD

JUMPER OPTIONS FOR PROGRAM ROMS ONLY

MANUFACTURER	EPROM NO.	JW#2	JW#4	JW#5	JW#6	JW#7	JW#18	JW#19	
MOTOROLA	68764	#	#	*	#	*	*	#	
MOTOROLA	68766	#	#	*	#	*	*	#	
T. I.	2564	#	#	*	#	*	*	#	
INTEL	2764	*	*	#	*	#	#	*	

JUMPER OPTIONS FOR BACKGROUND ROMS ONLY

MANUFACTURER	EPROM NO.	JW#10	JW#11	JW#12	JW#13	JW#14	JW#15	JW#16	JW#17
MOTOROLA	68764	*	#	*	#	*	#	#	*
MOTOROLA	68766	*	#	*	#	*	#	#	*
T. I.	2564	*	#	*	#	*	#	#	*
INTEL	2764	#	*	#	*	#	*	*	#

SOUND I/O P. C. BOARD

MANUFACTURER	EPROM NO.	JW#1	JW#2
NUMEROUS MFR'S	2532	*	#
NUMEROUS MFR'S	2732	#	*

* = CUT JUMPER WIRES WHERE THIS SYMBOL "*" APPEARS.
= LEAVE JUMPER WIRES IN WHERE THIS SYMBOL "#" APPEARS.

The above table illustrates the fact that the Video Generator P.C. Board used in the MCR II System has 8 jumper wires, the SUPER C.P.U. P.C. Board used in the MCR II System has 19 jumper wires, and the Sound I/O P.C. Board used in the MCR II System has 2 jumper wires.

All of the above Boards can be used with a variety of different **SETS of EPROM chips.** However, these EPROMS are not all made by the same manufacturer and do have some internal differences. So, in order to make them function properly in their respective P.C. Boards, certain jumper wires on these Boards have to be cut.

The above table tells you which jumpers to cut (depending on which EPROM set you're going to use) by showing a "*" under that jumper wire's number. If there is **NO "*"** under a jumper wire's number, THAT PARTICULAR JUMPER WIRE **IS NOT TO BE CUT.**

VII. Coin Door Maintenance

SPECIAL NOTE: If you have any questions about the coin acceptors in your game(s), please feel free to contact their manufacturers. Each manufacturer's name is **PROMINENTLY** imprinted on every acceptor mechanism.

Metal mechanisms only:
COIN MECHANISMS, INC.
817 Industrial Drive
Elmhurst, IL 60126
Phone (312) 279-9150

Metal and Plastic mechanisms:
COINCO COIN ACCEPTORS, INC.
860 Eagle Drive
Bensenville, IL 60106
Phone (312) 766-6781

COIN DOOR MAINTENANCE

METAL COIN ACCEPTOR MECHANISMS

Periodically, the metal coin acceptor mechanism(s) must be removed from the coin door and cleaned.

1. **Make sure the power to the game is off.**
2. Unlock and open the coin door.
3. Remove the coin acceptor mechanism as shown in Figure 7-1.
   - ☐ Push down on the two spring loaded latches.
   - ☐ While holding the latches down, pull the top of the coin acceptor mechanism toward you.
   - ☐ Release the latches and lift out the coin acceptor mechanism.

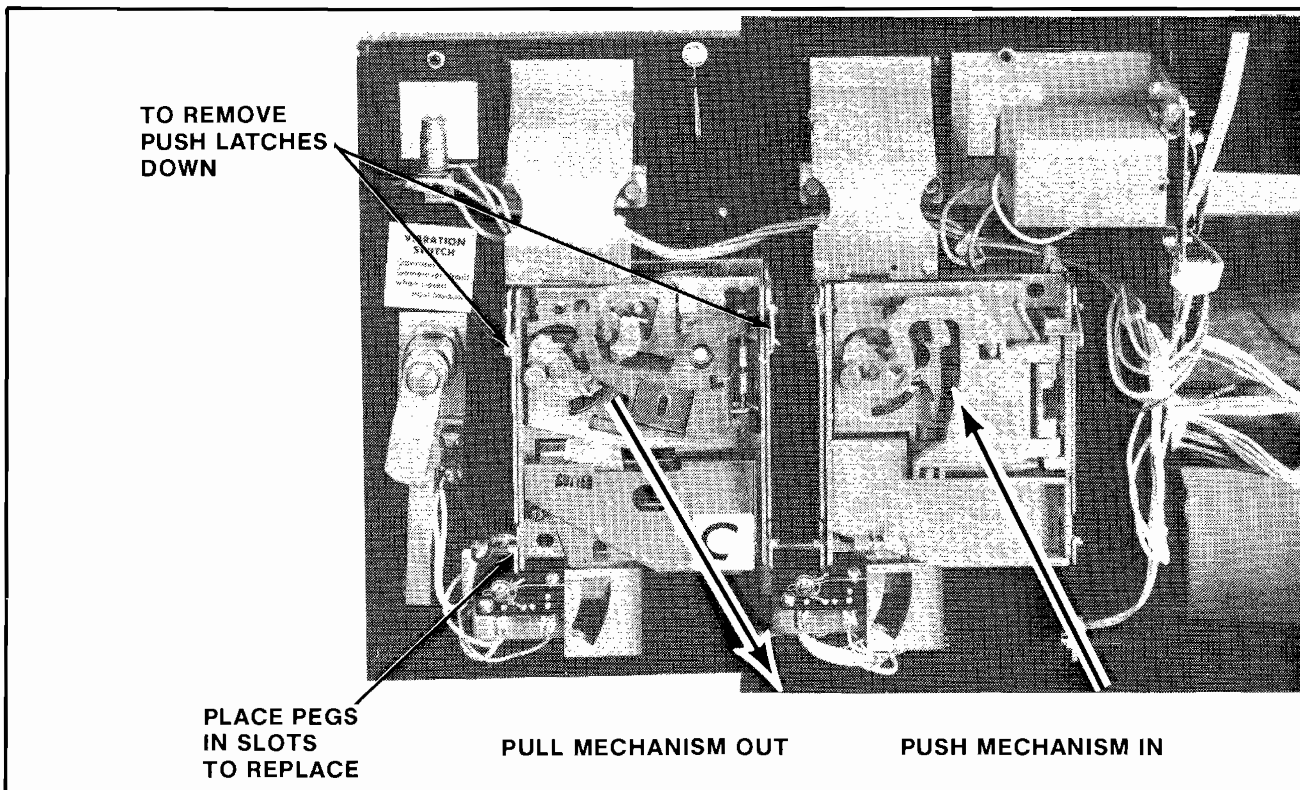


Figure 7-1 Removing and replacing coin acceptor

4. Clean the magnet of all foreign particles. See Figure 7-2.
   - ☐ This may be accomplished by swinging the gate open as shown in the above figure.
5. Remove the cradles and undersize levers and clean the bushings. (A pipe cleaner makes a good bushing cleaner.)
   - ☐ Also clean the pivot pin.
6. Whenever needed, the coin acceptor should be cleaned with hot water and cleanser in the following manner:
   - ☐ Place the coin acceptor in boiling water for about ten minutes.

CAUTION: BE CAREFUL NOT TO BURN YOURSELF.

- ☐ Next, use a brush and kitchen cleaner to remove all remaining foreign matter from the unit.
- ☐ Rinse the coin acceptor in clean boiling water.
- ☐ Dry the coin acceptor thoroughly by using filtered compressed air to blow it dry.

NOTE: The reason we recommend using boiling water is that it evaporates faster than cold water and speeds drying time.

7. To lubricate the coin acceptor:
   - ☐ Use **ONLY** powdered graphite and put it **ONLY** on the moving parts of the coin acceptor. These parts are called out in Figure 7-3.
   - ☐ Be extremely careful to keep the powdered graphite away from paths that are traveled by the coins.

— WARNING —
DO NOT USE OIL TO LUBRICATE THE COIN ACCEPTOR.

8. Check the coin chute for obstructions such as: paper, gum, etc.
9. Reinstall the coin acceptor to the coin door. See Figure 7-1.
   - ☐ Place the two pegs at the coin acceptor's base into their retaining slots.
   - ☐ Now push the top of the coin acceptor toward the coin door until it snaps in place and is held there by the two spring loaded latches.
10. Close and lock the coin door.

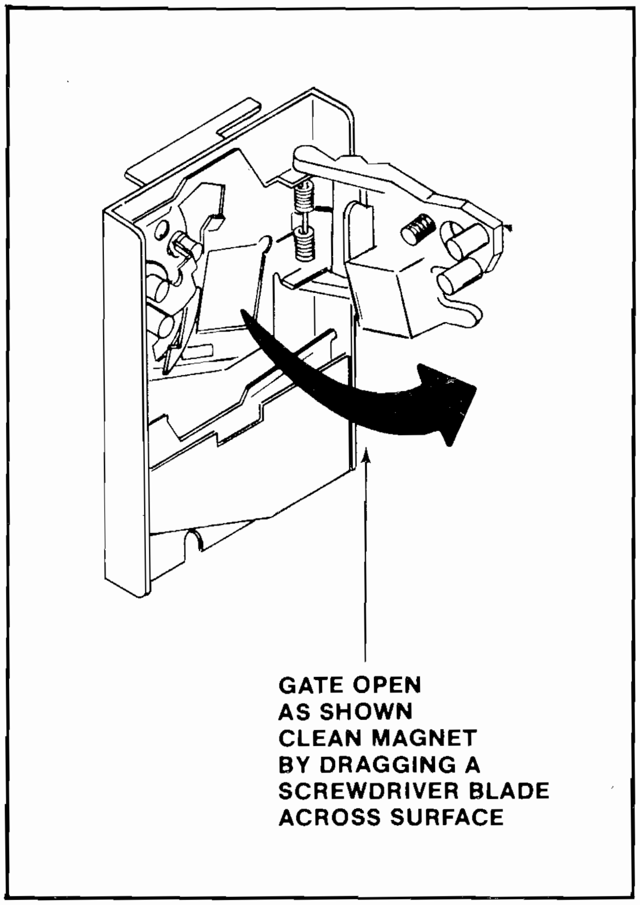


Figure 7-2 Cleaning the metal coin acceptor

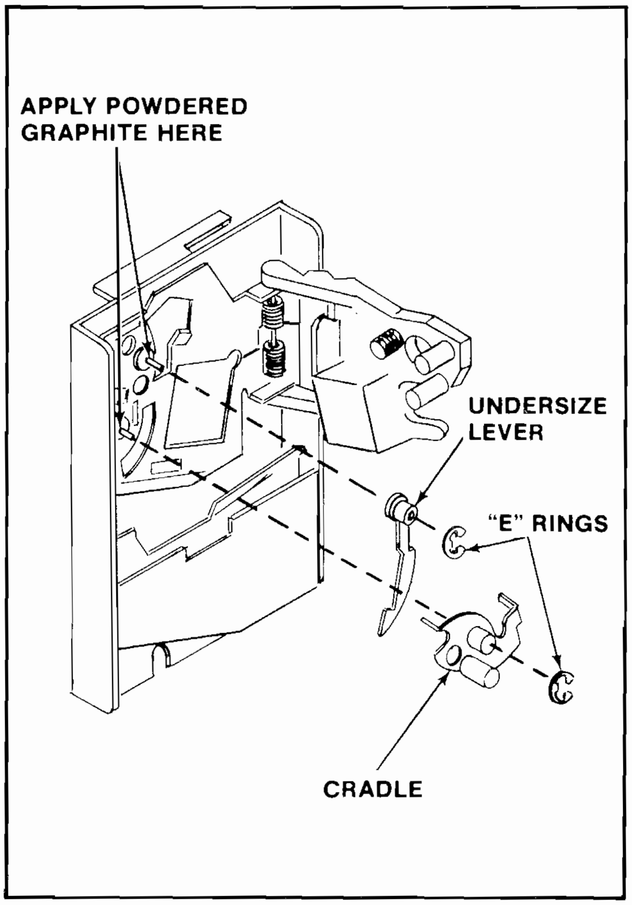


Figure 7-3 Lubricating the metal coin acceptor

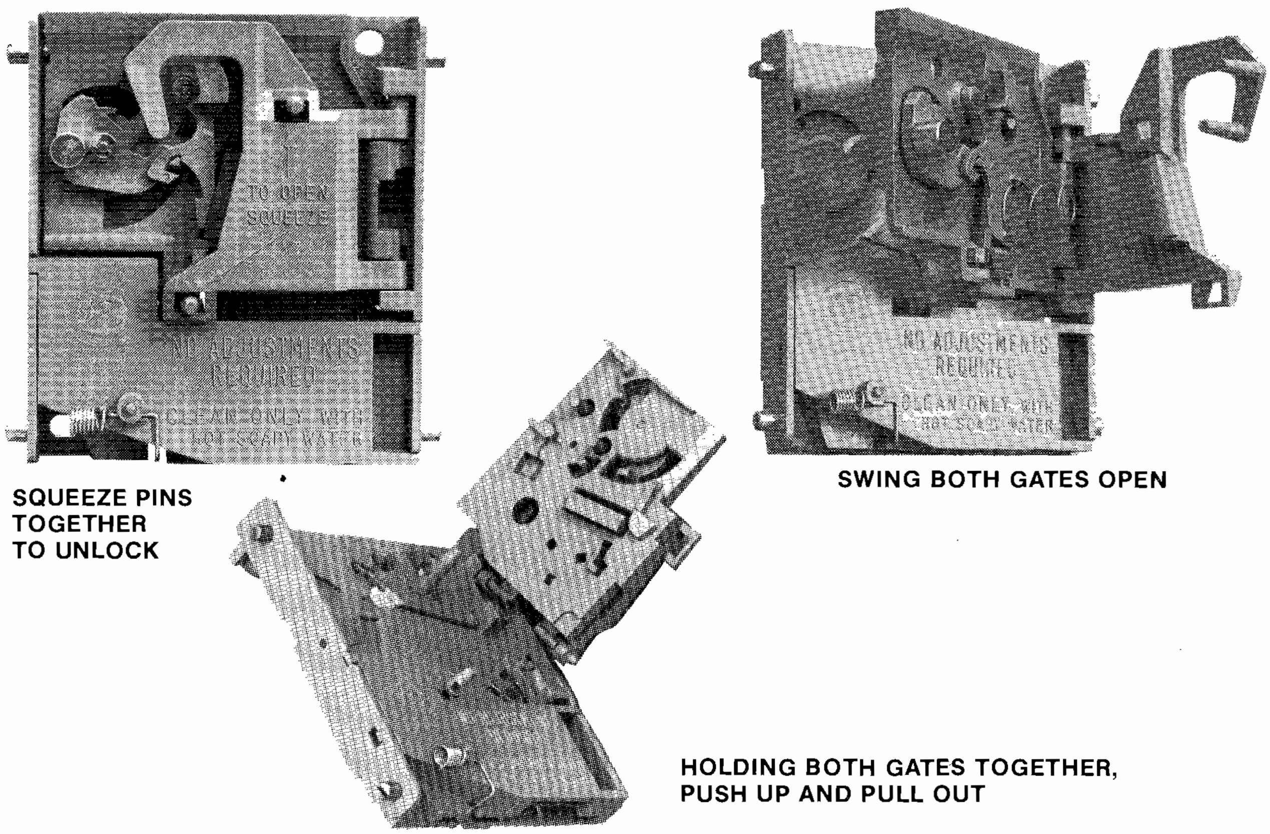


Figure 7-4 Opening the plastic coin acceptor

PLASTIC COIN ACCEPTOR MECHANISMS

The plastic coin acceptor mechanism(s) must be removed periodically from the coin door and cleaned.

1. **Make sure the power to the game is off.**
2. Unlock and open the coin door.
3. Remove the coin acceptor mechanism(s) as shown in Figure 7-1.
   - ☐ Push down on the two spring loaded latches.
   - ☐ While holding the latches down, pull the top of the acceptor mechanism toward you.
   - ☐ Release the latches and lift out the mechanism.
4. Squeeze the two pins indicated in Figure 7-4 together to open the mechanism and break it down into its three basic parts.
   - ☐ Clean the mechanism in hot soapy water. It never rusts.
   - ☐ Rinse the mechanism in clean hot water and allow it to dry.
   - ☐ Reassemble the mechanism (it never needs lubrication).
5. Check the coin chute for obstructions such as: paper, gum, etc.
6. Reinstall the coin acceptor to the coin door. See Figure 7-5.
   - ☐ Place the two pegs at the coin acceptor's base into their retaining slots.
   - ☐ Now push the top of the coin acceptor toward the coin door until it snaps in place and is held there by the two spring loaded latches.
7. Close and lock the coin door.

NOTE: See Figure 7-6 for instructions on how to set the plastic coin acceptor mechanisms to either accept or reject Canadian quarters.

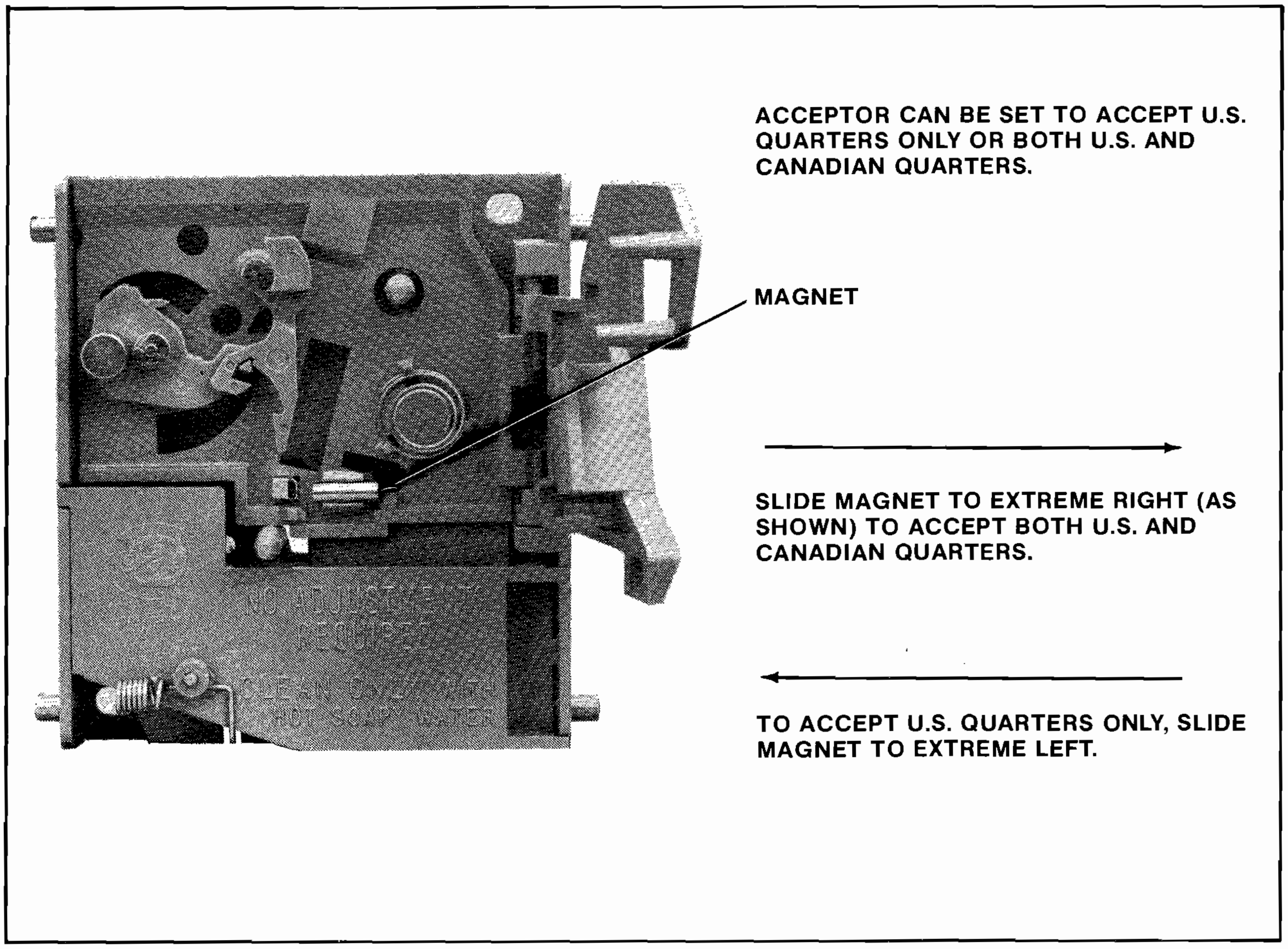


Figure 7-5 Changing the plastic coin acceptor to accept American or Canadian quarters.

PLEASE NOTE:

THE INFORMATION CONTAINED IN THIS SECTION IS TOLD IN AN EASY TO UNDERSTAND MANNER AND IS INTENDED TO AID THOSE WITHOUT AN ELECTRONICS DEGREE IN TROUBLESHOOTING AND REPAIRING THEIR GAMES T.V. MONITOR.

IF YOU READ THROUGH THIS SECTION AND STILL HAVE QUESTIONS, PLEASE CONTACT YOUR DISTRIBUTOR OR MIDWAY MANUFACTURING COMPANY AT THE TOLL FREE NUMBER PROVIDED WITH YOUR GAMES PAPERS.

OUR STAFF AND OUR DISTRIBUTORS STAND READY TO HELP YOU!

THANK YOU

VIII T.V. Monitor Manual

Color T.V. Monitor

Introduction: (How to use this section of your manual.)

This section has been designed to simply familiarize you with one of the more mystical components in your game — the T.V. monitor. If you are an electronics technician who is quite knowledgeable on the subject, you may decide to just go to the schematics and start troubleshooting the defective monitor. But if you are like most people, a monitor is a T.V. set, and that means a complex doo-dad that means big buck repairs. This isn't necessarily so. This section of the manual will acquaint you with the monitor and could just help you repair it if you feel adventurous enough to give it a try. If you have any knowledge of electronics, especially the use of a voltmeter, the repairs you can make are astonishing. Just keep in mind that **ELECTRICITY CAN BE VERY DANGEROUS, SO BE CAREFUL!!**

If you want to understand how a monitor works, just read the "THEORY OF OPERATION" subsection. If you wish, you can follow along with the schematics. The information is presented in a very basic manner but more complete treatment of the subject can be found in the technical sections of bookstores.

If you want to attempt to repair your monitor, it would be a good idea to read this whole section beginning to end before starting. **Pay attention to all warnings and take them seriously**. The more equipment you have the better, but a low cost Volt-Ohm-Milliameter can often do the trick. Here are the steps to take:

1. Find the symptom that matches the problems your monitor has in the "SYSTEM — DIAGNOSIS" subsection. The diagnosis tells the circuit or area the problem may be in and possibly even the actual component causing it.
2. Once you have the circuit that is causing the trouble, read the "TROUBLESHOOTING" subsection to learn the procedure for finding the bad part.
3. Next, go to the schematic section and find the schematic that matches your monitor. It may be helpful to read the "DIFFERENCES BETWEEN MONITORS" subsection if you are unsure of which monitor you have. Use the schematic to see what parts are in the offending circuit.

That really is all there is to it. Just remember that there are some bizarre or rare symptoms not covered, or that a monitor may have two or more different problems that only a genius, the experienced, or an experienced genius can figure out. But be patient, follow safety precautions, and remember that there is also literature available from the monitor companies through your distributor or from Midway Manufacturing Company on request. (There is a toll free number on the back side of the front cover of this manual.)

Symptom Diagnosis

1. **Insufficient width or heighth:**
   A. Horizontal line (due to VERTICAL CIRCUIT DEFECT).
      - ☐ Bad yoke.
      - ☐ Bad vertical output section.
      - ☐ Open fusible resistor in vertical section.
      - ☐ Bad height control.
      - ☐ Bad flyback.

   B. Vertical line (due to HORIZONTAL CIRCUIT DEFECT).
      - ☐ Bad yoke.
      - ☐ Open width coil.
      - ☐ Open part in horizontal output section.
2. **Picture spread out too far or crushed in certain areas:**
   A. Horizontal or vertical output transistor.
   B. Bad component in output circuitry.
3. **Line too close with black spacing:**
   A. Problem in vertical section causing poor linearity.
4. **Poor focus and convergence:**
   A. Bad high voltage transformer ("flyback") or control.
   B. Focus voltage wire not connected to neckboard terminal.
5. **Colors missing; check:**
   A. Interface color transistors.
   B. Color output transistors.
   C. Cracked printed circuit board.
   D. Color circuits.
   E. Video input jack.
6. **Picture not bright enough:**
   A. Weak emission from picture tube. (Turn horizontal sync off frequency and put brightness all the way up for about 15 minutes. Occasionally this cures the problem.)
7. **Silvery effect in white areas; check:**
   A. Beam current transistors.
   B. Weak picture tube emission.
8. **Too much brightness with retrace lines; check:**
   A. Beam limiter transistors.
   B. Brightness and/or color blanking control set too high.
9. **Increasing brightness causes an increase in size and poor focus.**
   A. Weak high voltage rectifier or regulation (high voltage unit).
10. **Small picture and/or poor focus:**
    A. Low B+ voltage (power supply trouble).
11. **Vertical rolling:**
    A. Vertical oscillator transistor, IC, or circuit.
    B. No sync from logic board.
12. **Horizontal line across center:**
    A. Vertical output circuit is dead (see symptom No. 1. A.).
    B. Vertical oscillator is not putting out the right wave form.
13. **Picture bends:**
    A. Horizontal sync needs adjusting.
    B. Magnetic or electromagnetic interference.
14. **Flashing picture, visable retrace lines:**
    A. Broken neck board.
    B. Internal short circuit in the picture tube (arcing).
15. **Unsymmetrical picture or sides of picture:**
    A. Defective yoke.
16. **No brightness, power supply operating — No high voltage for the picture tube; check:**
    A. Horizontal oscillator.
    B. Horizontal amplifier and output.
    C. Flyback transformer (high voltage unit).
17. **No brightness, high voltage present; check:**
    A. Heater voltage to the tube at the neck board.
    B. Screen-grid voltage for the tube.
    C. Focus voltage.
    D. Grid to cathode picture tube bias.
18. **No high voltage; check:**
    A. For AC input to the "flyback".
    B. Horizontal deflection stages.
    C. Flyback transformer.
    D. Yoke.
    E. Power supply.
19. **No horizontal and vertical hold; check:**
    A. Sync transistors and circuit.
    B. Wires and jack from logic board to the monitor.
20. **Wavey picture — (power supply defect); check:**
    A. Transistors, diodes, electrolytic capacitors in the power supply.

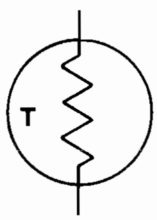
21. **Moving bars in picture:**
    A. Ground connector off between monitor and logic boards.
    B. Defect in the power supply (see wavy picture symptom).

22. **Washed out picture (see picture not bright enough):**
    A. Check video signal at the cathode pins with an oscilloscope. If there is about 80 volts peak to peak, the picture tube has weak emission.

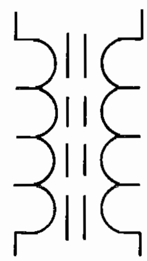
23. **Monitor won't turn on:**
    A. Problem in the power supply: Check fuse, transistors, open fusible resistor.
    B. Shorted horizontal output transistor.
    C. Defective high voltage disabling circuit.
    D. Crack(s) somewhere on main chassis board.

24. **Can't adjust purity or convergence:**
    A. Use a degausser to demagnetize the picture tube carefully following your degausser's instructions.
    B. Picture tube defective.
    C. Metal foreign material is in picture tube shield.
    D. Nearby equipment is electromagnetically interferring.
    E. The poles of the earth are pulling off the purity.
    F. Poor focus or width of picture.

Guide To Schematic Symbols



THERMISTOR
(POLARITY DOESN'T MATTER)



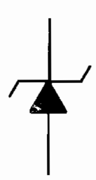
IRON CORE TRANSFORMER
(SUCH AS A FLYBACK)



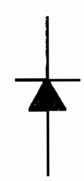
INDUCTOR, COIL, CHOKE
(POLARITY DOESN'T MATTER)



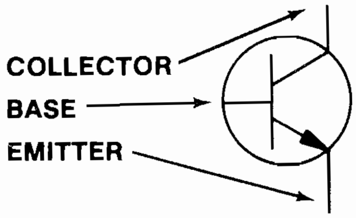
FUSE
(POLARITY DOESN'T MATTER)



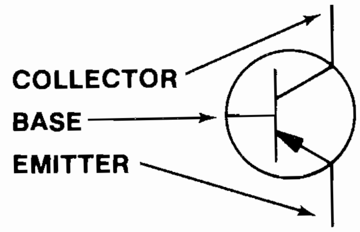
ZENER DIODE



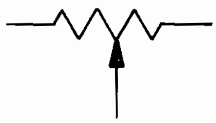
DIODE



NPN TRANSISTOR



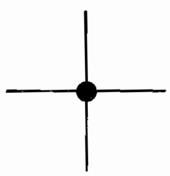
PNP TRANSISTOR



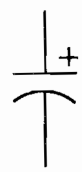
VARIABLE RESISTOR, POT, CONTROL
(POLARITY DOESN'T MATTER)



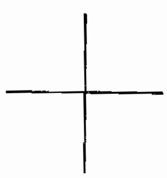
RESISTOR
(POLARITY DOESN'T MATTER)



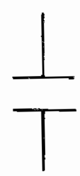
LINES ARE CONNECTED



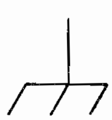
ELECTROLYTIC CAPACITOR



LINES ARE NOT CONNECTED



CAPACITOR
(POLARITY DOESN'T MATTER)



OR



GROUND

Troubleshooting

Troubleshooting monitors requires experience, patience, **and luck**. The first step is to match the symptom the monitor displays to the diagnosis next to it in the "SYMPTOM-DIAGNOSIS" subsection. This will pinpoint the circuit the problem is probably in, and often the parts to check. Next, the circuit should be visually inspected to see if there are any parts broken, burned, or if something is there that shouldn't be, like a loose screw, etc. Some parts go bad before others and should be checked first. In fact, following is the general order in which parts usually go bad:

1. Semiconductors (like transistors, diodes, and integrated circuits).
2. Fusible resistors.
3. Electrolytic capacitors.
4. Resistors.
5. Capacitors and coils.

Always remember that a monitor can bite like a snake. Even when it is turned off, capacitors hold voltage and will discharge it to you should you be touching chassis ground. The picture tube or CRT, itself, is a giant capacitor, so avoid the flyback anode plug hole. With the monitor on, the power supply circuit and/or the flyback, which puts out at least 18,000 volts, **CAN BE KILLERS!!** Avoid handling power transistors (usually output transistors), yoke terminals, and other high power components when the monitor is on.

WARNING: That picture tube is a bomb! When it breaks, first it implodes, then it explodes. Large pieces of glass have been known to fly in excess of 20 feet in all directions. **DO NOT** carry it by the long, thin neck. Discharge its voltage to ground by shorting the anode hole to ground. Use a plastic handled screwdriver, connect one end of a wire with an alligator clip at each end to chassis ground and the other end to the metal shaft of the screwdriver. Using ONE HAND ONLY (put the other in your pocket) and touching ONLY the plastic handle of the screwdriver **(DO NOT TOUCH THE METAL SHAFT)** stick the blade of the screwdriver into the anode hole. Be prepared for a fairly loud pop and a flash. The longer the monitor has been turned off, the smaller the pop and dimmer the flash. But **BE CAREFUL**, picture tubes will hold a very healthy charge for at least **a week** if not longer. Even after you've discharged it once, it may still carry a residual charge. It's better to be too careful than dead, which is why electronic equipment always carries stickers referring servicing to qualified personnel. Handle the side with the viewing screen against your chest when changing it. **ALWAYS** wear safety goggles when handling the picture tube.

To maintain the safety and performance of the monitor, always use exact replacement parts. For instance, the wrong components in the power supply can cause a fire, or the wrong color transistor may give a funny color to the picture. Service your monitor on a nonconductive firm table like wood, **NOT METAL,** and take off all of your jewelry just in case. With all this in mind, you are ready to begin troubleshooting.

Observe the picture carefully. Try to vary the appropriate control that would most likely affect your particular symptom. For example, if there is poor brightness or no picture, try turning up the brightness or contrast control. If the controls have no effect at all, chances are there is trouble with the control itself, the circuit it controls, or a nearby circuit that may be upsetting voltages. Go to the list of symptoms and determine with the schematic where the bad circuit is.

CAUTION:

Keep in mind that capacitors hold a charge as can the picture tube (for at least a week and usually longer), and could shock you.

First, check for obvious visual defects such as broken or frayed wires, solder where it is not supposed to be, missing components, burned components, or cracked printed circuit boards. If everything looks good up to this point, make sure that diodes, electrolytic capacitors, and transistors have their leads connected in the right polarity as shown on the schematic and the circuit board.

Turn on the power and measure the voltages at the leads of the active devices such as tubes, transistors, or integrated circuits. Any voltage that does not come within at least 10% to 15% of the voltage specified on the schematic indicates either a problem with that device or a component connected with it in the circuit. The next step is to use the ohmmeter to narrow down the field of possible offenders.

To test a transistor, one lead of the ohmmeter is placed on the base; and the other lead placed just on the emitter, then on the collector. A normal transistor will read either high resistance (infinite), or little resistance (400 to 900 ohms), depending on the polarity of this type transistor. Then the leads should be switched, one remaining on the base, and the other switched from the emitter to the collector. Now the opposite condition should result: the resistance should be infinite if it was lower when the other lead was on the base. Consistantly infinite readings indicate an open, and a short is demonstrated by 0-30 ohms on most of these test readings. Finally, place one lead on the collector, then the other on the emitter. No matter which lead is used, there should be infinite resistance. Any lower reading, such as 50 ohms (which is typical on a bad transistor), indicates a short.

This all sounds pretty confusing, but a little experience on a good transistor will make you an expert in no time. Usually, the lowest ohmmeter setting is used for testing transistors. Once in a great while a transistor may check out good on this test, but may actually be "leaky" or break down only on higher voltages. If in doubt, change it. It is also wise to check the transistor out of the circuit just in case some component in the circuit is affecting the ohmmeter reading.

A diode is tested like a transistor except it only has two leads. Again, there should be high resistance one way and little resistance the other. If it tests bad, take one lead out of the circuit in case some component is messing up the ohmmeter reading.

NOTE: **DO NOT** leave soldering equipment on the leads too long since all semiconductors, especially integrated circuits, are easily destroyed by heat.

Without special equipment, integrated circuits are checked by verifying the proper DC voltage on the pins and the correct AC wave form using an oscilliscope. **BE CAREFUL:** Shorting their pins can easily destroy them.

Resistors are checked with an ohmeter and should usually be within ten percent of the value stated on them and on the schematic. You may have to desolder one lead from the printed circuit board. If you wreck the foil on the board, carefully solder a small wire over the break to reconnect the conductive foil.

Capacitors are tricky. Their resistance goes up when checked with an ohmmeter which shows a charging action. As they suck up current from the meter, the voltage goes up and so does the resistance. If you are sure a particular circuit is giving you a problem and everything else checks out O.K., Electrolytic capacitors are prime suspects. Substitute a new one and keep your fingers crossed.

Theory of Operation

To understand what goes on inside the monitor, large general groups of circuits will be examined instead of laboriously analyzing the branches and small circuits that make up these groups. This will help avoid confusion and aid in a basic, concrete, knowledge of what makes up a monitor.

THE POWER SUPPLY —

The AC going to the monitor from the game transformer is just like the voltage and current from your wall outlet. It jumps up and down going positive and negative sixty times a second. But a monitor needs nice, smooth DC; direct current, not alternating. So diodes chop up the AC and a big electrolytic capacitor filters it out to make it even smoother. Since the monitor is a big piece of electronic equipment, with many circuits demanding a lot of power from the power supply, there are also zener diodes and transistors to help maintain a nice, constant, smooth voltage so that the monitor circuits don't jump around. And this is what happens when you see a wavy picture. There is AC creeping through the power supply, so it must be malfunctioning. If the voltage from the power supply is too low, the other circuits will be starved for power and you may see a small, wavy picture, or none at all.

Some circuits receive voltages that are higher than what the power supply should put out. But they come from the flyback transformer which will be discussed later.

THE INTERFACE SECTION OF THE CHASSIS —

The interface section of the chassis is fairly easy to identify. It is right by the place where the video jack(s) from the logic board(s) plug into. There are sets of transistors that receive the separate red, green, blue, and sync information from the cables that come from the logic boards. The circuits jack up the voltage and match impedances, or in other words, prepare the logic board outputs for the circuits that will really amplify them for the output devices such as the yoke in the case of the sync, or the picture tube that shows the colors.

An interesting aside is that our sync is composite negative sync. That means two things:

1. The sync is a negative going wave form.
2. There are two pulses going at different speeds over the same wire:
   a. Vertical wave forms at 60 times per second (or Hertz) and
   b. Horizontal wave forms at about 15,750 times per second (Hz).

The sync is amplified by a sync amplifier transistor and sent on its way to the oscillators. The sync or timing information will be explained along with the oscillator shortly.

The color information is sent via wires to the neck board where the main amplification occurs. This will also be discussed later.

VERTICAL AND HORIZONTAL DEFLECTION—

After the sync signal is amplified by the sync amp, it goes to two different sections, the vertical and horizontal circuits. Basically, the sync signals are for timing so the picture doesn't mess up since it is assembled like an orderly jigsaw puzzle, but so fast that you can't see the electron beams for each color painting the picture on the screen. This will all become clear soon. For now, we will follow the 60 cycle component of the sync as it goes on its journey to the deflection yoke.

The 60 cycle pulse goes to the vertical oscillator to make sure this circuit goes back and forth (or oscillates) at 60 times a second. Without this pulse keeping the circuit at the correct speed, it may get lazy and oscillate at 58 cycles or lower, or get ambitious and oscillate at 62 cycles or higher. At the wrong speed, the picture will start to roll up or down.

A Wells Gardner 13″ (K4806) or 19″ (K4906, K4956) color monitor uses an integrated circuit for its sync section. An Electrohome 13″ or 19″ color monitor uses an integrated circuit IC501 for its sync section. Wells Gardner uses HA11423 and Electrohome uses HA11244. **These ARE NOT interchangeable!** The idea is all the same. The output to the vertical amplifying transistors for all monitors must form a sawtooth wave form, sort of like a bunch of pyramids, racing through the yoke's vertical coils at 60 times a second.

Along the way to the output transistors, the 60 cycle pulse is shaped and amplified to do the job: the yoke magnetically pushes the electron beam to fill the screen out sideways looking at the screen with the greatest length going up and down. Or viewing the screen sitting like a home television set, the amplified vertical output fills the screen up and down. Watching a monitor like this, seeing only a horizontal line means a problem with the vertical coils of the yoke or anything from the vertical output section on back to the oscillator.

The horizontal section is very similar with a few exceptions. The horizontal wave shape is more like a square and has a frequency of 15,750 cycles a second. Both Wells Gardner and Electrohome use the other side of their respective integrated circuits for the horizontal circuitry. If the oscillator isn't going at the correct speed, the picture may move sideways, start to slant, or tear up with slanted thin figures. With both the vertical and horizontal of all monitors, there are variable resistors that change the speed of the oscillators up and down. This way you have controls that can make the correct frequencies to keep the electronic jigsaw puzzle nicely locked in place. If you're driving in a car and next to you someone else is driving their car at exactly the same speed, it will appear that they are not moving. And this is why the sync frequency and the oscillator's frequency must match, so the picture doesn't appear to move.

The correct wave form is shaped and amplified in the circuitry just like in the vertical section. But the horizontal output transistor is a large power transistor and not only serves to give current to the horizontal yoke windings, it also feeds the flyback transformer.

THE FLYBACK TRANSFORMER (OR HIGH VOLTAGE UNIT) —

The picture tube needs high voltage to light up, and the power supply can't meet this demand. The flyback transformer receives current alternating at about 15,750 times per second from the horizontal output transistor. The "flyback" jacks up its input voltage and puts out a higher voltage alternating at the same speed. But, in your "flyback" there are diodes that chop up the alternating voltage to make it a smooth DC output just like in the power supply. This is what goes through that thick red wire to your picture tube. THIS AREA HAS ABOUT 18,000 VOLTS ON IT **AND IT CAN KILL YOU!!**

The "flyback" may be dangerous, but it is also generous. It has extra output windings which give voltage to the heater pins of the picture tube, voltage for the vertical deflection circuits, and picture tube screen-grid voltage. So in a way, the high voltage "flyback" is like a second power supply.

COLOR CIRCUITS —

The color circuits are pretty straight forward. The signals go into the interface section where some amplification and impedance matching occurs. These circuits are pretty sparse and simple. Each color just has two transistors and a diode with some resistors and capacitors. From here, the AC color signal is sent by wires to the neck board.

The color output circuits are on the neck board. The color signals going to the transistors are controlled by two variable resistors called drive controls. There are only two, one for the red and one for the green.

The blue doesn't have one. In the emitter part of each transistor is another variable resistor that is the cut off control. These controls vary the amount of amplified AC signal that goes to the cathodes of the picture tube. The more signal, the more color. The bases of each of these transistors are connected together and are all connected to the blanking and beam limiting transistors which are in the interface section.

The beam limiter helps control the brightness level, and the blanking transistor rapidly turns the picture tube on and off so that retrace lines don't show up on the screen. By turning up the brightness on a good monitor, these four to six retrace lines can be seen slanting diagonally across the picture.

PROTECTION CIRCUIT —

To protect the high voltage section against voltages that are too high coming from the power supply which could cause X-rays to be emitted from the "flyback", a circuit senses the higher power supply voltage, and using a transistor, turns off the horizontal oscillator. Since the horizontal oscillator doesn't work, the horizontal output transistor has nothing to feed the "flyback" which in turn has nothing to feed the picture tube. The monitor will be silent, have no picture, and will appear to be off. **But don't be fooled.** There is still that excessive amount of voltage coming from the power supply. To find out, check at pin two of Wells Gardner's IC501 and emitter of X04 for the Electrohome monitor. Here are the voltages you should receive:

Wells Gardner = 130VDC
Electrohome = 120VDC

The best place to measure this voltage on an Electrohome monitor is at a pin marked B1 on the chassis. This is because a 13 inch color Electrohome monitor, The G07-FB0 or G07-902, has an integrated circuit and very little else in the power supply. Still, there should be 120VDC at B1.

THE PICTURE TUBE (OR CRT) —

The picture tube or CRT is an output device. In other words, the end result of the circuit's work is displayed by this part. Actually, the output of other circuits is in the neck of the picture tube.

First, there is the heater. The heater boils off electrons from the cathodes so that they (the electrons) shoot up to the screen to excite the phosphors so that the three phosphors emit three colors of light.

The cathodes are next, and again they emit electrons to turn on the tube phosphors, making it glow. The cathode can arc or short to the heater resulting in no picture and a defective picture tube.

Next come the grids. The first grid is grounded. The following grid is the screen grid which receives about 300VDC depending on the brightness setting. The next grid closest to the picture tube screen is the focus grid which gets about one fifth the amount of voltage that is applied to the picture tube anode.

After jetting from the cathode through all these grids, the electrons speed through a mask, a sheet of material with tiny holes, and then excite the tiny dots of phosphor in the inside surface of the picture tube screen. The green electron gun (or cathode and circuitry) spits out electrons which head for the green phosphors only. The same goes for the red and blue guns. The way the phosphor light blends determines the color seen. Should these electron beams become too intense, they may burn the phosphor. With the monitor off, this can be seen as a dark permanent image of the video information on the tube screen.

Differences Between Monitors

The easiest way to identify the brand of monitor you are working with, assuming you can't find the brand name written on it anywhere, is to check the color of the suction cup type insulator that houses that dangerous anode plug on the CRT. Both monitors use a red wire but the Wells Gardner anode cup is BLACK while the Electrohome anode cup is LIGHT GRAY. Unfortunately, "call-out-numbers" for parts, circuit layout, and even circuit design are similar enough to confuse the average observer.

Let's say you have an Electrohome that isn't working. No problem. You can scavenge parts from an old broken up one that you may have around.

Now let's say you have a Wells Gardner that isn't working. **STOP!!** This could be a problem. There are 3 different types of Wells Gardner K4900 **SERIES** monitors in the games. Here are ways to identify them.

K4906 (1st TYPE) — This monitor's identifying tags have **BLACK** ink printed on a white background. There is **NO** Vertical Damping Control. (This Control would be next to the Vertical Hold Control but this area is jumpered with a small wire instead.

K4906 (2nd TYPE) — This monitor's identifying tags have **RED** ink printed on a white background. There **IS** a Vertical Damping Control next to the Vertical Hold Control. The Damping Control provides a few more lines on the top of the monitor screen (monitor viewed as a normal T.V. would be) for any video game that may need these lines to fit the picture on the

screen. Moving the Control may distort the top part of your picture (or the side, depending on the game and how the monitor is mounted) so go ahead and move it if you are having this type of problem. To accommodate this new feature, there are a few circuit changes.

ONE MAJOR DIFFERENCE BETWEEN THESE TWO VERSIONS OF THE K4906 IS THE YOKE. They look the same but notice the part numbers:

K4906 **WITHOUT** the Damper Control: 2021111201

K4906 **WITH** the Damper Control: 2021111258

Since the companies like to change part numbers at the drop of a hat, the best thing to do is to request whatever part number is written on your yoke. If you should get the wrong yoke, the results will be:

Picture distortion.
Excessive brightness.
Too much or too little vertical picture size.

K4956 (3rd TYPE) — This monitor is identical to the K4906 **WITHOUT** the Damper Control **EXCEPT** the picture tube is vertically mounted and there is an additional small P.C. Board mounted on the monitor where the yoke plugs in. This monitor is used on some Cocktail Table games where the picture has to flip for the second player.

Generally speaking, some games flip the picture image via the logic board programming but this monitor is used in games that flip the picture image via generation of a small signal voltage which is sent to the extra P.C. Board on this monitor. This signal voltage causes relays on this extra P.C. Board to flip the picture by reversing the horizontal and vertical signals to the yoke pins.

What kind of problems can this extra P.C. Board cause? If the relays become defective, the picture won't flip. If the P.C. Board gets cracked you may have a horizontal line on the screen, a vertical line on the screen, or maybe just a dot in the center of the screen. Of course, the logic board could be defective and not sending the signal to flip the picture. In any case, some people feel that using relays is cheaper, simpler, and more reliable, so this is an advantage.

CONTROLS YOU MAY NOT TOUCH

Basically, on the Electrohome monitor, you can move any control you want **EXCEPT** for the B1 control. This sets the power supply voltage (ideally at 120 VDC) and is located right behind VERTICAL HOLD. The 13" Electrohome **DOES NOT** have this control. It may also be wise not to move the VERTICAL LINEARITY since this distorts the picture and is hard to reset perfectly. If you do move it, turn on the Cross Hatch Test Pattern of your game and try to get the squares to the point where they are equal in size by readjusting this Linearity Control.

On the Wells Gardner monitor, brightness is adjusted by the "BLACK LEVEL" Control which is right next to the Horizontal Frequency Control. Under the Focus Control is the "SCREEN" Control which you **DO NOT** touch. Yes, this control does adjust the brightness, but it is used to set the CRT bias and is adjusted at the factory. When Wells Gardner sets it, they mark the position with a black mark on the knob. If you move it, be sure to realign the mark and THEN set the BLACK LEVEL Control to the brightness you desire. So, other than the SCREEN control, you may adjust any of the controls.

Parts Interchangeability

Some parts can be interchanged on all of the monitors. Here are the rules:

1. You **CAN** swap any resistor between monitors that has the same resistance, wattage rating, and tolerance.
2. You **CAN** swap any capacitor between monitors that has the same capacitance and voltage rating.
3. You **CAN** swap many of the parts between the 19" and the 13" versions of each manufacturer's monitor. **BUT,** be certain to compare the manufacturers' part numbers to be positive the parts you want to interchange are identical. **BE SURE** you have read the section DIFFERENCES BETWEEN MONITORS which was covered earlier.
4. You **CANNOT** swap any picture tubes between monitors!! In the past you could, but Wells Gardner is now using a new monitor. When ordering a replacement picture tube, **ALWAYS SPECIFY THE PICTURE TUBE NUMBER!**
5. You **CANNOT** change any part that is a **safety part,** one that is shaded in gray on the schematic; it **MUST** be **IDENTICAL** to the original. **To do otherwise IS DANGEROUS.** For instance, the 13 inch Electrohome (G07-902) monitor "flyback" looks identical to the 19 inch Electrohome (G07-904) monitor "flyback". In fact, there is even a 19 inch Electrohome (G07-905) monitor (which is an obsolete model) with a similar looking "flyback". **NONE OF THESE ARE INTERCHANGEABLE!!**
6. You **CAN** change any of the parts between the G07-904 and G07-907. They're essentially the same monitor except that the G07-907 has a vertically mounted picture tube.

If there is any doubt about what parts can be swapped between each manufacturer's 19 inch and 13 inch models, compare the manufacturer's part number between each one. If they match up, they are the same part.

19" COLOR MONITOR SCHEMATIC DIAGRAM
MODELS 19K4901, 19K4906, 19K4951, 19K4956

Power Supply Voltage and Symbols

Symbol	Voltage	Operating Circuit
■ (circled)	15V	Vert. Osc. Sync Blanking CRT Cut-Off
⊗	130V	Horiz. Osc. Horz. Drive Horz. Output Vert. Output
⊙	175V	Video Output

★

SERVICE TECHNICIAN WARNING
X-RAY RADIATION PRECAUTION:

THIS PRODUCT CONTAINS CRITICAL ELECTRICAL AND MECHANICAL PARTS ESSENTIAL FOR X-RAY RADIATION PROTECTION.
FOR REPLACEMENT PURPOSES, USE ONLY TYPE PARTS SHOWN IN THE PARTS LIST.

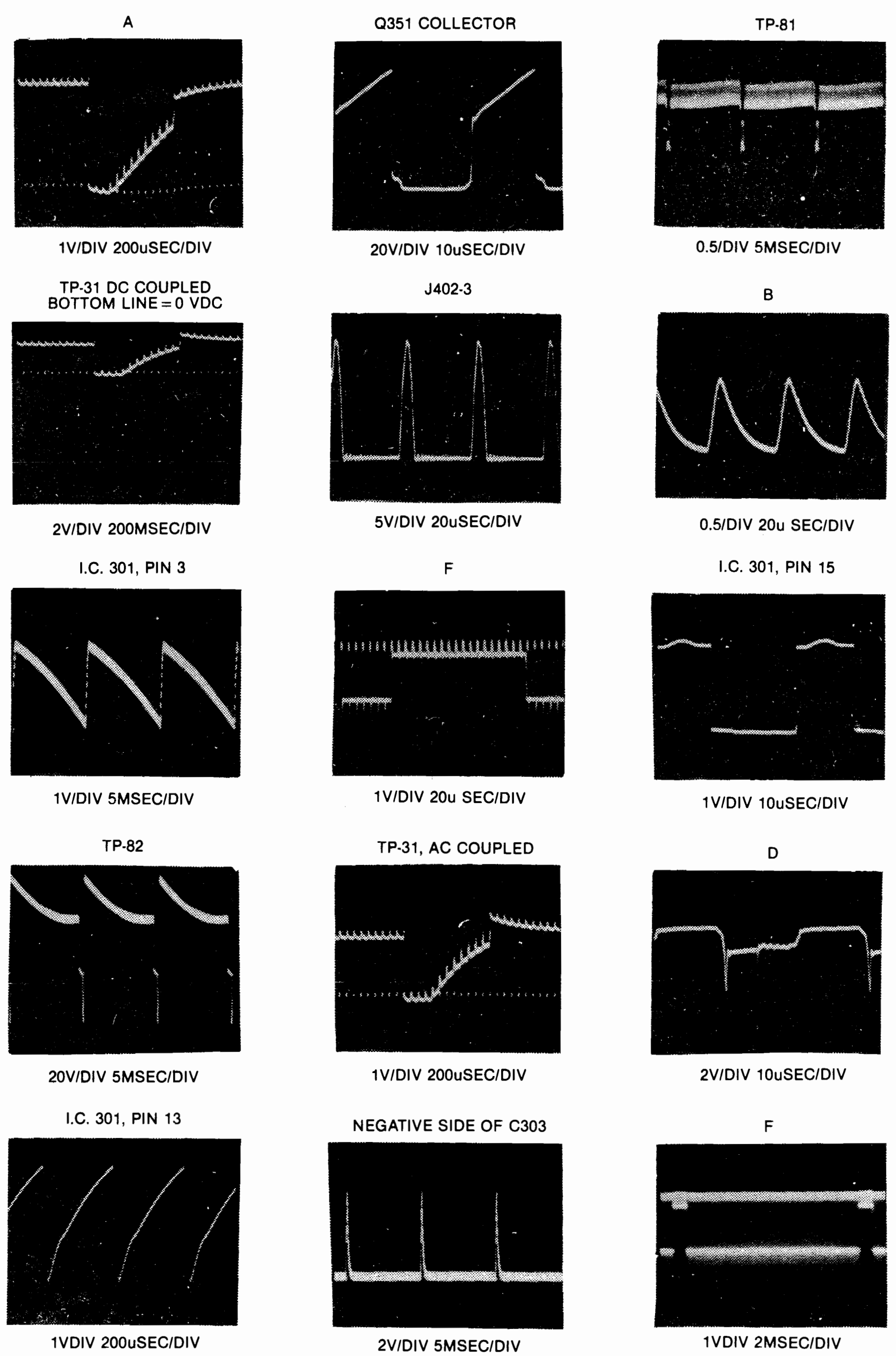
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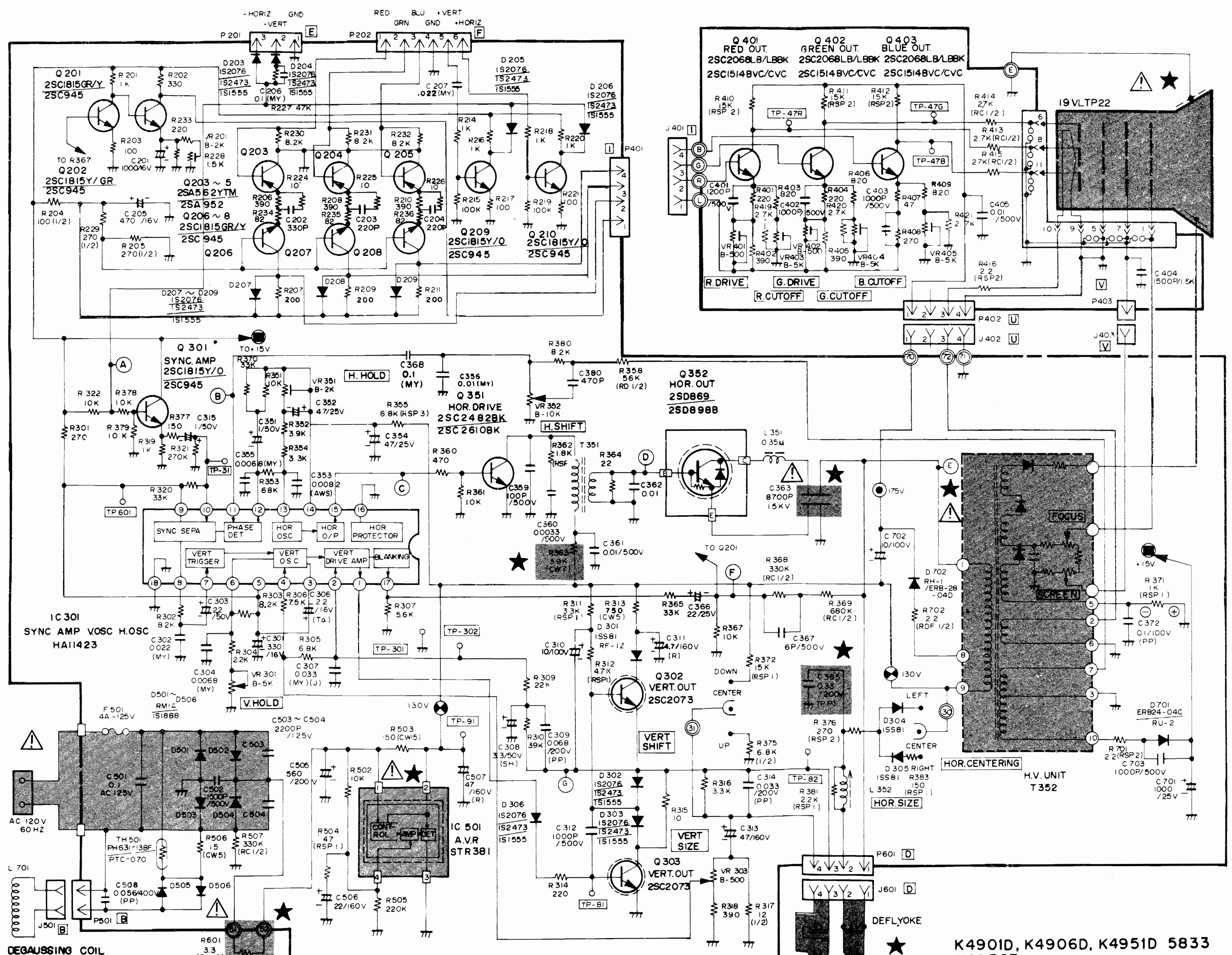
CAUTION: FOR CONTINUED SAFETY, REPLACE SAFETY CRITICAL COMPONENTS ONLY WITH MANUFACTURER'S RECOMMENDED PARTS.
AVERTISSEMENT: POUR MAINTENIR LE DEGRE DE SECURITE DE L'APPAREIL NE REMPLACER LES COMPOSANTS DONT LE FONCTIONNEMENT EST CRITIQUE POUR LA SECURITE QUE PAR DES PIECES RECOMMANDEES PAR LE FABRICANT.

OSCILLOSCOPE WAVEFORM PATTERN

The waveforms shown are as observed on the wide band oscilloscope with the monitor turned to a reasonably strong signal and a normal picture. The voltages shown on each waveform are the approximate peak amplitudes.

If the waveforms are observed on the oscilloscope with a poor high frequency response, the corner of the pulses will tend to be more rounded than those shown and the amplitude of any high frequency pulse will tend to be less.





REPLACEMENT PARTS LIST

This monitor contains circuits and components included specifically for safety purposes.

For continued protection no changes should be made to the original design, and components shown in shaded areas of schematic, or ⚠★ on parts list should be replaced with exact factory replacement parts.

The use of substitute parts may create a shock, fire, radiation or other hazard. Service should be performed by qualified personnel only.

MAIN BOARD

RESISTORS

Ref. No.	Part No.	Description
R201	203X6500-645	1K Ohm, 5%, 1/4W Carbon
R202	203X6500-523	30 Ohm, 5%, 1/4W Carbon
R203	203X6500-405	100 Ohm, 5%, 1/4W Carbon
R204	203X6700-327	100 Ohm, 5%, 1/2W Carbon
R205	203X6700-421	270 Ohm, 5%, 1/2W Carbon
R206	203X6500-540	390 Ohm, 5%, 1/4W Carbon
R207	340X2201-934	200 Ohm, 5%, 1/4W Carbon
R208	203X6500-540	390 Ohm, 5%, 1/4W Carbon
R209	340X2201-934	200 Ohm, 5%, 1/4W Carbon
R210	203X6500-540	390 Ohm, 5%, 1/4W Carbon
R211	340X2201-934	200 Ohm, 5%, 1/4W Carbon
R214	203X6500-645	1K Ohm, 5%, 1/4W Carbon
R215	203X6501-126	100K Ohm, 5%, 1/4W Carbon
R216	203X6500-645	1K Ohm, 5%, 1/4W Carbon
R217	203X6500-405	100 Ohm, 5%, 1/4W Carbon
R218	203X6500-645	1K Ohm, 5%, 1/4W Carbon
R219	203X6501-126	100K Ohm, 5%, 1/4W Carbon
R220	203X6500-645	1K Ohm, 5%, 1/4W Carbon
R221	203X6500-405	100 Ohm, 5%, 1/4W Carbon
R222	203X6500-762	3.3 Ohm, 5%, 1/4W Carbon
R224	203X6500-169	10 Ohm, 5%, 1/4W Carbon
R225	203X6500-169	10 Ohm, 5%, 1/4W Carbon
R226	203X6500-169	10 Ohm, 5%, 1/4W Carbon
R227	203X6501-044	47K Ohm, 5%, 1/4W Carbon
R228	203X6500-645	1K Ohm, 5%, 1/4W Carbon
R229	203X6700-421	270 Ohm, 5%, 1/2W Carbon
R230	203X6500-863	8.2K Ohm, 5%, 1/2W Comp.
R231	203X6500-863	8.2K Ohm, 5%, 1/2W Comp.
R232	203X6500-863	8.2K Ohm, 5%, 1/2W Comp.
R233	203X6500-468	180 Ohm, 5%, 1/4W Carbon
R234	340X2820-934	82 Ohm, 5%, 1/4W Carbon
R235	340X2820-934	82 Ohm, 5%, 1/4W Carbon
R236	340X2820-934	82 Ohm, 5%, 1/4W Carbon
R301	203X6500-508	270 Ohm,5%, 1/4W Carbon
R302	203X6500-863	8.2K Ohm, 5%, 1/4W Carbon
R303	203X6500-863	8.2K Ohm, 5%, 1/4W Carbon
R304	203X6500-724	2.2K Ohm, 5%, 1/4W Carbon
R305	203X6500-842	6.8K Ohm, 5%, 1/4W Carbon
R306	203X6003-201	7.5K Ohm, 2%, 1/4W Carbon
R307	203X6500-825	5.6K Ohm, 5%, 1/4W Carbon
R309	203X6500-965	22K Ohm, 5%, 1/4W Carbon
R310	203X6500-988	39K Ohm, 5%, 1/4W Carbon
R311	203X6500-762	3.3K Ohm, 5%, 1/4W Carbon
R312	203X9014-741	4.7K Ohm, 5%, 1/4W Carbon
R313	204X1450-537	1K Ohm, 5%, 5W Carbon
R314	203X6500-481	220 Ohm, 5%, 1/4W Carbon
R315	203X6500-169	10 Ohm, 5%, 1/4W Carbon
R316	203X6500-762	3.3K Ohm, 5%, 1/4W Carbon
R317	203X6700-107	12 Ohm, 5%, 1/2W Carbon
R318	203X6500-540	390 Ohm, 5%, 1/4W Carbon
R319	203X6500-645	1K Ohm, 5%, 1/4W Carbon
R320	203X6501-002	33K Ohm, 5%, 1/4W Carbon
R321	203X6501-224	270K Ohm, 5%, 1/2W Carbon
R322	203X6500-886	10K Ohm, 5%, 1/4W Carbon
R351	203X6500-886	10K Ohm, 5%, 1/4W Carbon
R352	203X6500-785	3.9K Ohm, 5%, 1/4W Carbon
R353	203X6501-088	68K Ohm, 5%, 1/4W Carbon
R354	203X6500-762	3.3K Ohm, 5%, 1/4W Carbon
R355	203X9205-143	6.8K Ohm, 5%, 3W Metal Oxide
R358	203X5601-878	56K Ohm, 5%, 1/2W Carbon
R360	203X6500-561	470 Ohm, 5%, 1/4W Carbon
R361	203X6500-886	10K Ohm, 5%, 1/4W Carbon
R362	203X9014-645	1.8K Ohm, 5%, 1W Metal Oxide
★R363	204X1527-751	3.9K Ohm, 5%, 7W Metal Oxide
R364	203X6500-246	22 Ohm, 5%, 1/4W Carbon
R365	203X6501-002	33K Ohm, 5%, 1/4W Carbon
R367	203X6500-886	10K Ohm, 5%, 1/4W Carbon
R368	203X5602-185	330K Ohm, 5%, 1/2W Comp.

RESISTORS (CONT.)

Ref. No.	Part No.	Description
R369	203X5602-329	680K Ohm, 5%, 1/2W Comp.
R370	203X6501-002	33K Ohm, 5%, 1/4W Carbon
R371	203X9014-584	1K Ohm, 5%, 1W Metal Oxide
R372	203X9101-119	12K Ohm, 5%, 1W Metal Oxide
R375	203X6700-763	6.8K Ohm, 5%, 1/2W Carbon
R376	203X9104-404	270 Ohm, 5%, 2W Metal Oxide
R377	203X6500-447	150 Ohm, 5%, 1/4W Carbon
R378	203X6500-886	10K Ohm, 5%, 1/4W Carbon
R379	203X6500-886	10K Ohm, 5%, 1/4W Carbon
R380	203X6500-865	8.2K Ohm, 5%, 1/4W Carbon
R381	203X6500-724	2.2K Ohm, 5%, 1W Metal Oxide
R383	203X9014-387	150 Ohm, 5%, 1W Metal Oxide
R502	203X6500-886	10K Ohm, 5%, 1/4W Carbon
R503	204X1700-535	150 Ohm, 5%, 15W Metal Oxide
R504	203X9014-267	47 Ohm, 5%, 1W Metal Oxide
R505	203X6501-209	2.2K Ohm, 5%, 1/4W Carbon
R506	203X9104-105	15 Ohm, 5%, 2W Metal Oxide
R507	203X5602-185	330K Ohm, 5%, 1/2W Comp.
⚠★R601	204X1625-058	3.3 Ohm, 5%, 10W WW
R701	203X9105-141	2.2 Ohm, 5%, 2W Metal Oxide
R702	203X6206-441	2.2 Ohm, 5%, 1/2W Carbon
VR201	204X2070-072	2K Ohm-B Semi-Fixed
VR301	204X2070-084	5K Ohm-B Semi-Fixed
VR303	204X2070-055	500 Ohm-B Semi-Fixed
VR351	204X2070-072	2K Ohm-B Semi-Fixed
VR352	204X2070-072	2K Ohm-B Semi-Fixed

CAPACITORS

Ref. No.	Part No.	Description
C201	203X0014-088	1000 uF, 16V, Electrolytic
C202	202X7200-064	330 pF, 500V, Ceramic
C203	202X7200-043	220 pF, 500V, Ceramic
C204	202X7200-043	220 pF, 500V, Ceramic
C205	203X0014-076	470 uF, 16V, Electrolytic
C206	203X1810-149	0.1 uF, 125V Mylar
C207	349X2232-109	.022 uF, 100V Mylar
C301	203X0014-065	330 uF, 50V Electrolytic
C302	203X1600-563	0.033 uF, 50V Mylar
C303	203X0629-037	3.3 uF, 50V Electrolytic
C304	203X1600-366	0.068 pF, 50V Mylar
C306	203X0412-012	2.2 uF, 16V Tantal
C307	203X1600-634	0.033 uF, 50V Mylar
C308	203X0025-174	3.3 uF, 50V Electrolytic
C309	203X1207-100	0.068 uF, 100V PP
C310	203X0629-061	10 uF, 100V Electrolytic
C311	203X0041-025	10 uF, 160V Electrolytic
C312	202X7050-248	1000 pF, 500V Ceramic
C313	203X0040-052	47 uF, 160V Electrolytic
C314	203X1201-265	0.033 uF, 200V PP
C315	203X0629-023	1 uF, 50V Electrolytic
C351	203X0629-023	1 uF, 50V Electrolytic
C352	203X0619-045	47 uF, 25V Electrolytic
C353	203X1190-015	0.0082 pF, 50V Mylar-PP
C354	203X0619-045	47 uF, 25V Electrolytic
C355	203X1600-366	0.0068 pF, 50V Mylar
C356	202X7050-483	0.01 uF, 500V Ceramic
C359	202X8065-606	100 pF, 500V Ceramic
C360	202X7050-366	0.0033 pF, 500V Ceramic
C361	202X7050-483	0.01 uF, 500V Ceramic
C362	202X7203-032	0.01 uF, 50V Ceramic
⚠★C363	203X1270-911	8700 pF, 1.5 KV PP
★C365	203X1201-265	0.33 uF, 200V PP
C366	203X0019-026	22 uF, 25V Electrolytic
C367	202X8065-162	6 pF, 500V Ceramic
C368	202X7203-032	0.01 uF, 50V Ceramic
C372	203X1207-125	0.1 uF, 100V PP

MAIN BOARD (CONT.)

Ref. No.	Part No.	Description
		CAPACITORS (CONT.)
C380	202X7200-087	470 uF, 500V Ceramic
⚠ C501	203X1810-149	0.1 uF, 125V Mylar
⚠ C502	202X7050-282	1500 pF, 500V Ceramic
⚠ C503	202X7810-214	2200 pF, 125V Ceramic
⚠ C504	202X7810-214	2200 pF, 125V Ceramic
C505	203X0220-075	560 uF, 200V Electrolytic
C506	203X0040-034	22 uF, 160V Electrolytic
C507	203X0041-057	47 uF, 160V Electrolytic
C701	203X0019-092	1000 uF, 25V Electrolytic
C702	203X0634-061	10 uF, 100V Electrolytic
C703	202X7050-248	1000 pF, 500V Ceramic
		SEMICONDUCTORS
D203	201X2010-159	Diode, IS2076-27
D204	201X2010-159	Diode, IS2076-27
D205	201X2010-159	Diode, IS2076-27
D206	201X2010-159	Diode, IS2076-27
D207	201X2010-159	Diode, IS2076-27
D208	201X2010-159	Diode, IS2076-27
D209	201X2010-159	Diode, IS2076-27
D301	201X2010-165	Diode, ISS81
D302	201X2010-159	Diode, IS2076-27
D303	201X2010-159	Diode, IS2076-27
D304	201X2120-009	Diode, RH-IV
D305	201X2120-009	Diode, RH-IV
D306	201X2010-159	Diode, IS2076-27
⚠ D501	201X3120-216	Diode, RM-1AV
⚠ D502	201X3120-216	Diode, RM-1AV
⚠ D503	201X3120-216	Diode, RM-1AV
⚠ D504	201X3120-216	Diode, RM-1AV
D505	201X3120-216	Diode, RM-1AV
D506	201X3120-216	Diode, RM-1AV
D701	201X2130-234	Diode, RU-2V
D702	201X2120-009	Diode, RH-1V
Q201	200X3181-523	Transistor (NPN) 2SC1815GR
Q202	200X3181-523	Transistor (NPN) 2SC1815GR
Q203	200X4056-260	Transistor (PNP) 2SA562-Y-TM
Q204	200X4056-260	Transistor (PNP) 2SA562-Y-TM
Q205	200X4056-260	Transistor (PNP) 2SA562-Y-TM

Ref. No.	Part No.	Description
		SEMICONDUCTORS (CONT.)
Q206	200X3181-523	Transistor (NPN) 2SC1815GR
Q207	200X3181-523	Transistor (NPN) 2SC1815GR
Q208	200X3181-523	Transistor (NPN) 2SC1815GR
Q209	200X3181-523	Transistor (NPN) 2SC1851GR
Q210	200X3181-523	Transistor (NPN) 2SC1851GR
Q301	200X3181-523	Transistor (NPN) 2SC1851GR
Q302	200X3207-306	Transistor (NPN) 2SC2073LBGL2
Q303	200X3207-306	Transistor (NPN) 2SC2073LBGL2
Q351	200X3248-217	Transistor (NPN) 2SC2482BK
Q352	200X4589-802	Transistor (NPN) 2SD898B
IC301	200X2300-033	IC HA11423
⚠★ IC501	200X2600-183	IC STR381
		TRANSFORMERS & COILS
L351	201X4710-134	Coil, (RF Choke)
L352	201X5000-083	Coil, Horiz. Size
L701	611X0004-007	Coil, Adg.
T351	202X1300-080	Transformer, Hor. Drive
⚠★ T352	200X9720-301	HV-Unit M-11
		MISCELLANEOUS
⚠ F501	204X7120-073	Fuse, 4 Amp. 125V
J402	206X5008-632	Recep W Wire 3P-M-BG
P201	204X9600-466	Plug, PWB 3P-J
P202	204X9601-477	Plug, PWB 6P-Q
P401	204X9600-298	Plug, PWB 4P-B
P501	204X9600-249	Plug, PWB 2P-B
P601	204X9600-304	Plug, PWB 4P-C
TH501	201X0100-112	Thermistor
		FINAL ASSEMBLY PARTS
⚠★	88X0138-506	19VLTP22 Pix Tube
	205X9800-158	Lateral/Purity Assembly
⚠★	202X1111-201	Yoke Deflection
	204X9301-255	CRT Socket
	291X5004-262	Automatic Degaussing Coil Unit

NECK BOARD

RESISTORS

R401	203X6000-729	220 Ohm, 5% 1/4W Carbon
R402	203X6500-540	390 Ohm, 5% 1/4W Carbon
R403	203X6000-661	820 Ohm, 5% 1/4W Carbon
R404	203X6000-729	220 Ohm, 5% 1/4W Carbon
R405	203X6500-540	390 Ohm, 5% 1/4W Carbon
R406	203X6000-661	820 Ohm, 5% 1/4W Carbon
R407	203X6000-729	470 Ohm, 5% 1/4W Carbon
R408	203X6000-998	270 Ohm, 5% 1/4W Carbon
R409	203X6000-661	820 Ohm, 5% 1/4W Carbon
R410	203X9104-824	15K Ohm, 5% 2W M.O. Forming
R411	203X9104-824	15K Ohm, 5% 2W M.O. Forming
R412	203X9104-824	15K Ohm, 5% 2W M.O. Forming
R413	203X6000-998	2.7K Ohm, 5% 1/2W Comp.
R414	203X6000-998	2.7K Ohm, 5% 1/2W Comp.
R415	203X6000-998	2.7K Ohm, 5% 1/2W Comp.
R416	203X9105-154	2.2 Ohm, 5% 2W Metal Oxide
R419	203X6500-741	2.7K Ohm, 5% 1/4W Carbon
R420	203X6500-741	2.7K Ohm, 5% 1/4W Carbon
R421	203X6500-741	2.7K Ohm, 5% 1/4W Carbon
VR401	204X2115-014	500 Ohm, -B Semi-Fixed
VR402	204X2115-014	500 Ohm, -B Semi-Fixed
VR403	204X2115-006	5K Ohm, -B Semi-Fixed
VR404	204X2115-006	5K Ohm. -B Semi-Fixed
VR405	204X2115-006	5K Ohm, -B Semi-Fixed

CAPACITORS

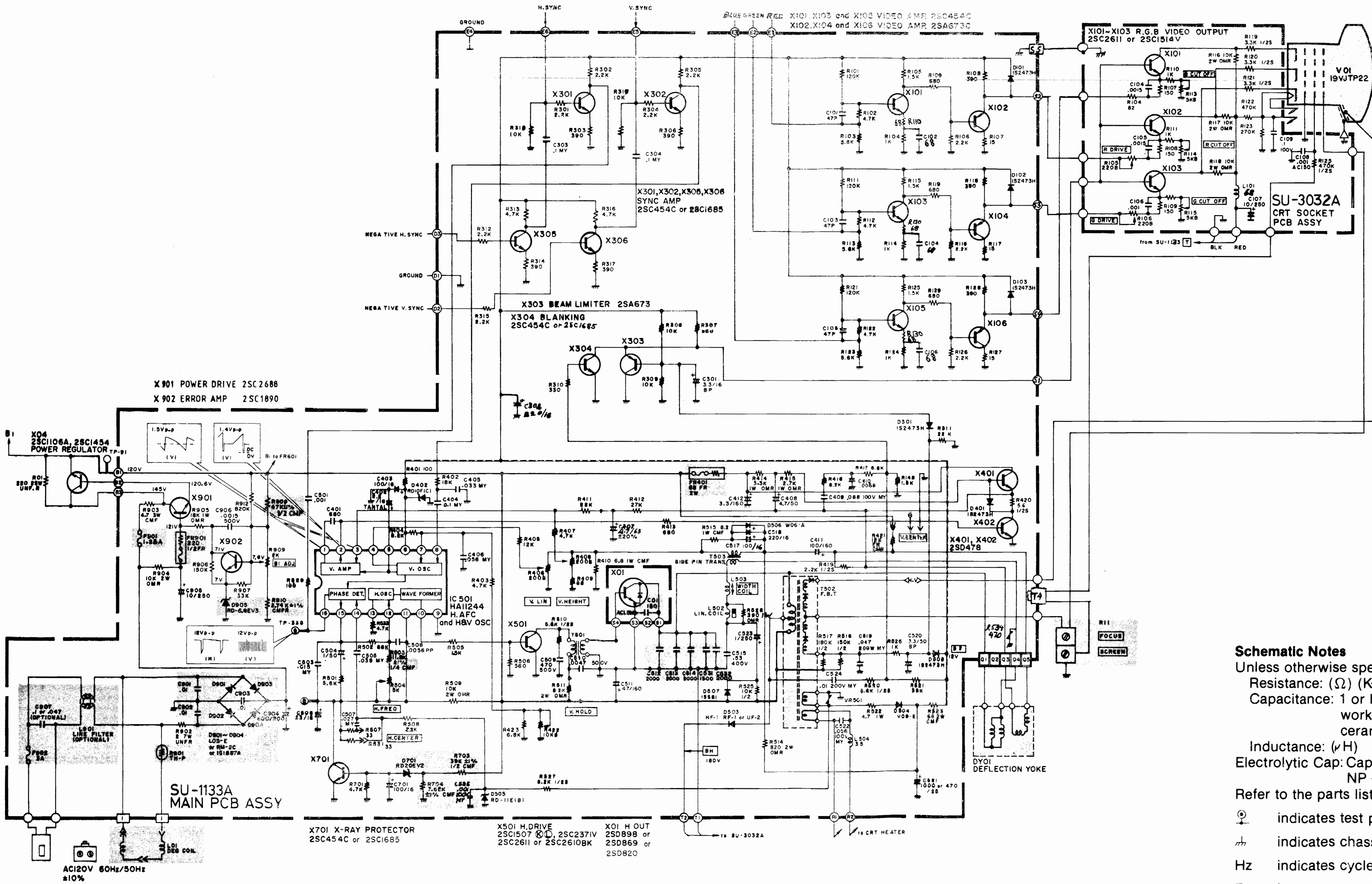
C401	202X7050-269	1200 pF, 500V Ceramic
C402	202X7050-248	1000 pF, 500V Ceramic
C403	202X7050-248	1000 pF, 500V Ceramic
C404	202X7050-282	1500 pF, 1.5KV Ceramic
C405	202X7050-483	0.01 uF, 500V Ceramic

SEMICONDUCTORS

Q401	200X3206-800	Transistor (NPN) 2SC2068LB
Q402	200X3206-800	Transistor (NPN) 2SC2068LB
Q403	200X3206-800	Transistor (NPN) 2SC2068LB

MISCELLANEOUS

J401	206X5009-296	RECEP W Wire 4P-E
P402	204X9600-254	Plug, PWB 3P-A
P403	204X9600-981	Plug, Pin 1P-D
P701	204X9601-020	Plug, PWB 4P-E



Schematic Notes

Unless otherwise specified
Resistance: (Ω) (K→KΩ, M→MΩ), 1/4 (W) carbon resistor
Capacitance: 1 or higher→ (pF), less than 1→ (μF)
working voltage→ 50 (V)
ceramic capacitor
Inductance: (μH)
Electrolytic Cap: Capacitance Value (μF)/working voltage (V),
NP → non-polar (or bipolar) electrolytic cap.
Refer to the parts list for additional component information.

- indicates test point connection
- indicates chassis ground unless otherwise specified

Hz indicates cycles per second

For **safety** purposes (and continuing reliability)
⚠ replace all components marked with safety symbol with identical type.
NOTE: FR → fusible resistor

Parts identification on circuit boards:
e.g. SU1126A (R107 = R**1**107)
SU3030A (R113 = R**3**113)

00-4147-04
G07-CB0

REPLACEMENT PARTS LIST - ELECTROHOME 19" MONITOR

> Components identified by the ⚠ symbol in the PARTS LIST and on the Schematic have special characteristics important to safety.
>
> DO NOT degrade the safety of the set through improper servicing.

Abbreviations for Resistors and Capacitors

Resistor

C R	: Carbon Resistor
Comp. R	: Composition Resistor
OM R	: Oxide Metal Film Resistor
V R	: Variable Resistor
MF R	: Metal Film Resistor
CMF R	: Coating Metal Film Resistor
UNF R	: Nonflammable Resistor
F R	: Fusible Resistor

Capacitor

C Cap.	: Ceramic Capacitor
M Cap	: Mylar Capacitor
E Cap.	: Electrolytic Capacitor
BP E Cap.	: Bi-Polar (or Non-Polar) Electrolytic Capacitor
MM Cap.	: Metalized Mylar Capacitor
PP Cap.	: Polypropylene Capacitor
MPP Cap.	: Metalized PP Capacitor
PS Cap	: Polystyrol Capacitor
Tan. Cap.	: Tantal Capacitor

NOTE: When ordering replacement parts please specify the part number as shown in this list including part name, and model number. Complete information will help expedite the order.

Use of substitute replacement parts which do not have the same safety characteristics as specified, may create shock, fire or other hazards. For maximum reliability and performance, all parts should be replaced by those having identical specifications.

SERVICE REPLACEMENT PARTS LIST

Symbol	Description	Part Number
	Main P.C.B. Ass'y	SU-1133A
	CRT Socket P.C.B. Ass'y	SU-3032A
	Purity Shield Ass'y	07-220083-03

utside of the P.C.B. Ass'y

ymbol	Description	Part Number
	Picture Tube 19"	17-7198-03
	⚠Deflection Yoke	A29779-D = 21-141-01
	PC Magnet	A75034-B = 29-32-01
	⚠Flyback Transf.	A29951-B
	⚠HVR	A46600-A
05	UNF Resistor 220Ω,25W K	QRF258K-221
04	C Capacitor 150pF, AC1.5KV	QCZ0101-005
01	Si. Transistor	2SD870
02	Si. Transistor	2SC1106A
C	Screw #8-$\frac{3}{8}$	31-610818-06
C	Screw ¼ x ¾ Pix Tube Mtg. (4)	31-601418-12
A	Pyramidal Lock Washer (4)	33-255-01
	Nut Retainer, Pix Tube Mtg. (4)	33-494-01
	Clip — P.C.B. Support	33-629-02
	Standoff	33-670-010R-02
	Wire Terminal (Gnd. Strap)	34-228-03
	Terminal Lug (Gnd.)	34-33-04
	Groundstrap Assy.	34-574-02
	Grounding Spring	35-212-03
	Wire Hook (Gnd. Strap)	35-3053-02
	Purity Shield Holddown Clamp	35-2348-01
	Support Brkt. RH	35-3890-01
	Support Brkt. LH	35-3890-02
	Chassis Base	38-449-02
	Yoke Wedge (3)	39-1233-01

urity Shield Ass'y. Parts List

ymbol	Description	Part Number
	Degaussing Coil	21-1007-30
911, D912	Rectifier 1 Amp 600V (2)	28-22-27
	Pin Terminal (2)	34-708-01
	Pin Terminal Housing	34-709-01
	Purity Shield (2 pcs.)	35-3847-01
	Purity Shield (2 pcs.)	35-3847-02
911	Capacitor 100nF 10% 400V	48-171544-62
921	Resistor, Wirewound 33Ω, 4W	42-113301-03
	Fire Retardent Term. Strip 4 Lug	34-492-09

RT Socket P.C.B. Ass'y (SU-3032A) Parts List

esistors

ymbol	Description			Part Number
3105	V	R	200	QVZ3234-022
3106	V	R	200	QVZ3234-022
3113	V	R	5K	QVZ3234-053
3114	V	R	5K	QVZ3234-053
3115	V	R	5K	QVZ3234-053
3116	OM	R	10KΩ2W J	QRG029J-103
3117	OM	R	10KΩ2W J	QRG029J-103
3118	OM	R	10KΩ2W J	QRG029J-103
3119	Comp.	R	3.3KΩ½W K	QRZ0039-332
3120	Comp.	R	3.3KΩ½W K	QRZ0039-332
3121	Comp.	R	3.3KΩ½W K	QRZ0039-332

apacitors

ymbol	Description			Part Number
3107	E	Cap.	10uF 250V A	QEW53EA-106
3108	C	Cap.	1000pF DC1400V P	QCZ9001-102M

oils

ymbol	Description	Part Number
3101	Peaking Coil	QQL043K-101

Semiconductors

Symbol	Description	Part Number
X3101	Si. Transistor	2SC1514VC
X3102	Si. Transistor	2SC1514VC
X3103	Si. Transistor	2SC1514VC

Miscellaneous

Symbol	Description	Part Number
⚠	⚠CRT Socket	A76068

Main PCB Ass'y (SU-1133A) Parts List

Resistors

Symbol	Description			Part Number
R1406	V	R	200Ω	QVZ3230-002
R1408	V	R	200Ω	QVZ3230-002
R1410	CMF	R	6.8Ω1W J	QRX019J-6R8
R1414	OM	R	3.3KΩ1W J	QRG019J-332
R1415	OM	R	2.7KΩ1W J	QRG019J-272
R1421	OM	R	12KΩ2W J	QRG026J-123Z
R1422	V	R	10KΩ	QVZ3230-014
⚠FR1401	⚠F	R	68Ω2W K	QRH024K-680M
⚠R1503	⚠CMF	R	11.8KΩ¼W +1%	QRV142F-1182
R1504	V	R	5KΩ	QVZ3230-053
R1509	OM	R	10KΩ2W J	QRG026J-103Z
R1512	OM	R	8.2KΩ2W J	QRG026J-822Z
R1514	OM	R	820Ω2W J	QRG026J-821Z
R1515	CMF	R	8.2Ω1W J	QRX019J-8R2
R1522	CMF	R	4.7Ω1W J	QRX019J-4R7
R1523	OM	R	68Ω2W J	QRG026J-680Z
R1528	OM	R	390Ω1W J	QRG019J-391
R1534	ZN	R		ERZ-C05ZK471
VR1501	ZN	R		ERZ-C05DK271
⚠R1703	⚠CMF	R	39Ω½W +1%	QRV122F-3902
⚠R1704	⚠CMF	R	7.68KΩ¼W +1%	QRV142F-7681
⚠R1901	⚠Posistor			A75414
R1902	UNF	R	2Ω7W K	QRF076K-2R0
R1903	CMF	R	4.7Ω3W J	QRX039J-4R7
R1904	OM	R	10KΩ2W J	QRG026J-103Z
R1905	OM	R	18KΩ1W J	QRG019J-183
⚠Q1908	⚠CMF	R	47Ω½W +1%	QRV122F-470Z
⚠R1909	V	R	2KΩ	QVP5A0B-023E
R1910	⚠CMF	R	2.74KΩ¼W +1%	QRV142F-2741
⚠FR1901	⚠F	R	220Ω½W K	QRH124K-221M

Capacitors

Symbol	Description		Part Number
C1301	BPE	Cap. 3.3uF 50V A	QEN61HA-335Z
C1402	Tan.	Cap. 2.2uF 16V K	QEE51CK-225B
C1407	E	Cap. 4.7uF 6.3V A	QEW51JA-475
C1411	E	Cap. 100uF 160V A	QEW52CA-107
C1412	E	Cap. 3.3uF 160V A	QEW52CA-335
C1508	PP	Cap. 5600uF 50V J	QFP31HJ-562
⚠C1512	⚠PP	Cap. 2000pF DC1500V J	QFZ0082-202
⚠C1513	⚠PP	Cap. 2000pF DC1500V J	QFZ0082-202
⚠C1514	⚠PP	Cap. 2000pF DC1500V J	QFZ0082-202
C1515	PP	Cap. 0.53uF DC1200V J	QFZ0067-534
C1520	BPE	Cap. 3.3uF 50V A	QEN61HA-335Z
C1523	E	Cap. 1uF 160V A	QEW62CA-105Z
C1524	M	Cap. 0.1uF 200V K	QFM720K-104M
⚠C1531	⚠PP	Cap. 2000pF DC1500V J	QFZ0082-202
⚠C1532	⚠PP	Cap. 1500pF DC1500V J	QFZ0082-152
C1904	E	Cap.	QEY0034-001
C1905	E	Cap. 10uF 250V A	QEW52EA-106

Coils

Symbol	Description	Part Number
L1502	Linarity Coil	A39835
L1503	Width Coil	C30380-A
L1504	Heater Choke	C30445-A

Transformers

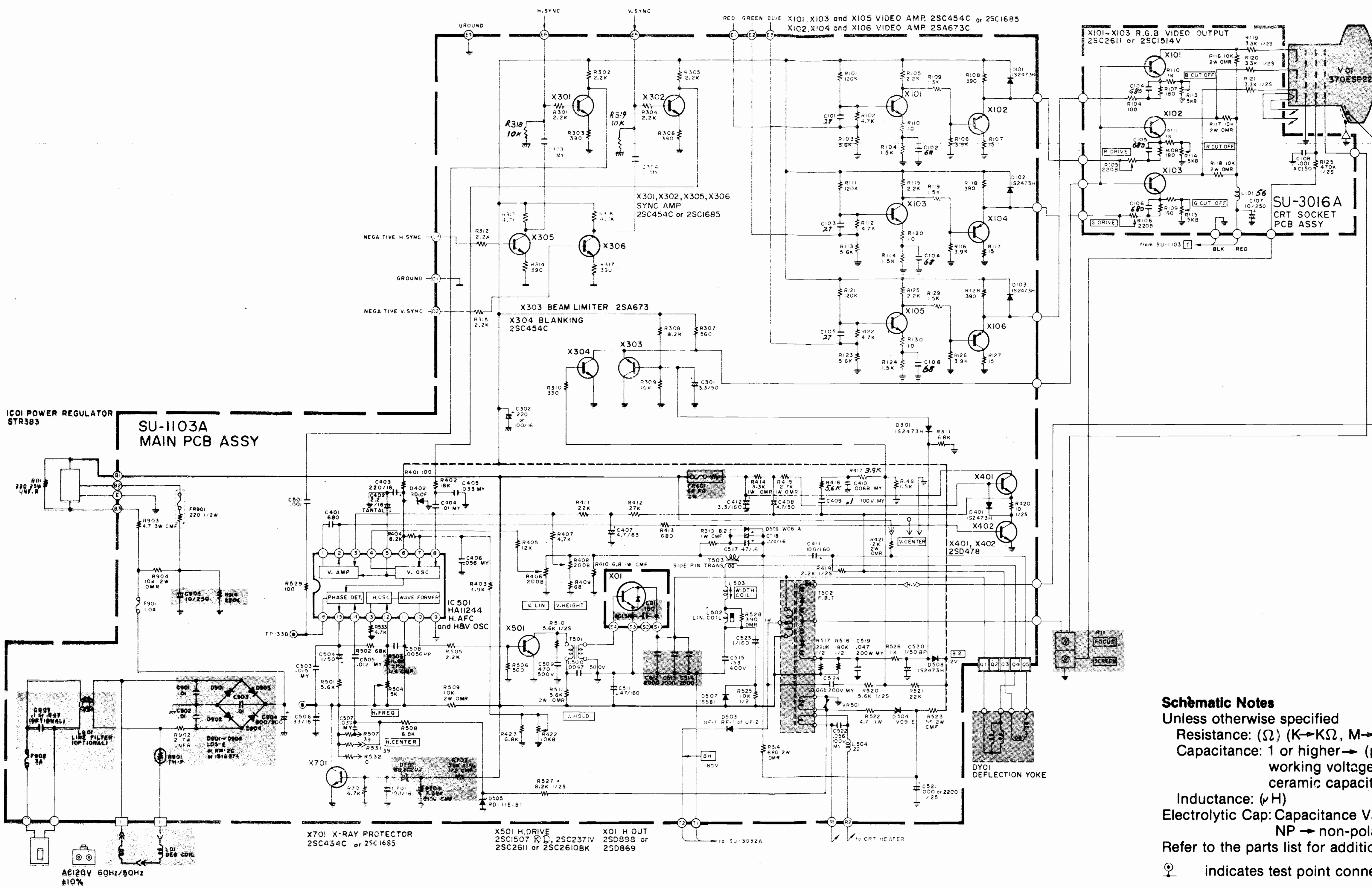
Symbol	Description	Part Number
T1501	Hor. Drive Transf.	A46022-BM
T1503	Side Pin Transf.	C39050-A

Semiconductors

Symbol	Description	Part Number
IC1501	IC	HA11244
X1101	Si. Transistor	2SC1685(R)
X1102	Si. Transistor	2SA673(C)
X1103	Si. Transistor	2SC1685(R)
X1104	Si. Transistor	2SA673(C)
X1105	Si. Transistor	2SC1685(R)
X1106	Si. Transistor	2SA673(C)
X1301	Si. Transistor	2SC1685(R)
X1302	Si. Transistor	2SC1685(R)
X1303	Si. Transistor	2SA673(C)
X1304	Si. Transistor	2SC1685(R)
X1305	Si. Transistor	2SC1685(R)
X1401	Si. Transistor	2SD478
X1402	Si. Transistor	2SD478
X1501	Si. Transistor	2SC2610BK
X1901	Si. Transistor	2SC2688 (K.L.M.)
X1902	Si. Transistor	2SC1890A (E.F.)
D1101	Si. Diode	W06A
D1102	Si. Diode	W06A
D1103	Si. Diode	W06A
D1301	Si. Diode	1SZ473H
D1401	Si. Diode	1SZ473H
D1402	Zener Diode	RD10F(C)
D1503	Si. Diode	HF-1
D1504	Si. Diode	V09E
D1505	Zener Diode	RD11E(B)
D1506	Si. Diode	W06A
D1507	Si. Diode	1SS81
D1508	Si. Diode	1SZ473H
⚠D1701	⚠Zener Diode	RD20EV2
⚠D1901	⚠Si. Diode	1S1887A
⚠D1902	⚠Si. Diode	1S1887A
⚠D1903	⚠Si. Diode	1S1887A
⚠D1904	⚠Si. Diode	1S1887A
⚠D1905	⚠Zener Diode	RD6.8EV3

Miscellaneous

Symbol	Description	Part Number
⚠F1901	⚠Fuse 1.25A	QMF53U1-1R25S
⚠F1902	⚠UL Fuse 3A	QMF66U1-3R0S



Schematic Notes

Unless otherwise specified

Resistance: (Ω) (K→KΩ, M→MΩ), 1/4 (W) carbon resistor

Capacitance: 1 or higher→ (pF), less than 1→ (μF)
working voltage→ 50 (V)
ceramic capacitor

Inductance: (μH)

Electrolytic Cap: Capacitance Value (μF)/working voltage (V),
NP → non-polar (or bipolar) electrolytic cap.

Refer to the parts list for additional component information.

⚲ indicates test point connection

⏚ indicates chassis ground unless otherwise specified

Hz indicates cycles per second

For **safety** purposes (and continuing reliability)

⚠ replace all components marked with safety symbol with identical type.
NOTE: FR → fusible resistor

G07-FBO
00-4147-03

Parts identification on circuit boards:
e.g. SU1126A (R107 = **R1**107)
SU3030A (R113 = **R3**113)

REPLACEMENT PARTS LIST - ELECTROHOME 13" MONITOR

Components identified by the ⚠ symbol in the PARTS LIST and on the Schematic have special characteristics important to safety.

DO NOT degrade the safety of the set through improper servicing.

Abbreviations for Resistors and Capacitors

Resistor		Capacitor	
C R	: Carbon Resistor	C Cap.	: Ceramic Capacitor
Comp. R	: Composition Resistor	M Cap	: Mylar Capacitor
OM R	: Oxide Metal Film Resistor	E Cap.	: Electrolytic Capacitor
V R	: Variable Resistor	BP E Cap.	: Bi-Polar (or Non-Polar) Electrolytic Capacitor
MF R	: Metal Film Resistor		
CMF R	: Coating Metal Film Resistor	MM Cap.	: Metalized Mylar Capacitor
UNF R	: Nonflammable Resistor	PP Cap.	: Polypropylene Capacitor
F R	: Fusible Resistor	MPP Cap.	: Metalized PP Capacitor
		PS Cap	: Polystyrol Capacitor
		Tan. Cap.	: Tantal Capacitor

NOTE: When ordering replacement parts please specify the part number as shown in this list including part name, and model number. Complete information will help expedite the order.

Use of substitute replacement parts which do not have the same safety characteristics as specified, may create shock, fire or other hazards. For maximum reliability and performance, all parts should be replaced by those having identical specifications.

Symbol	Description	Part Number
	Main P.C.B. Ass'y	SU-1103A
	CRT Socket P.C.B. Ass'y	SU-3016A

Outside of the P.C.B. Ass'y

Symbol	Description	Part Number
⚠V01	⚠Picture Tube	370ESB22(E)
⚠DY01	⚠Deflection Yoke	C29123-V
	PC Magnet	A76366-A
	Wedge	C30006
	⚠Flyback Transf.	A19183-A
⚠R11	⚠Focus V R	A46606-A
⚠R05	UNF Resistor 220Ω, 25W. K	QRF258K-221
⚠C04	⚠C Capacitor 150 pF, AC1.5KV	QCZ0101-005
X01	Si. Transistor	2SD869
IC01	IC Regulator	STR383
L01	Degausing Coil	21-1007-31
	Degausing Coil Pin Terminal (2)	34-708-01
	Degausing Coil Pin Terminal Housing	34-709-01
	Groundstrap Ass'y.	34-697-04
	Groundstrap Wire Terminal	34-228-03
	Groundstrap Spring (2)	35-3560-01
BR	Support Bracket RH	35-3919-01
BR	Support Bracket LH	35-3919-02
SC	SCREW 10-½ Pix Tube Mtg. (4)	31-631018-08
WA	Pyramidal Lockwasher (4)	33-255-01
	Clip P.C.B. Support (2)	33-629-02
	Ground Lug	34-33-04
CH	Chassis Base	38-452-01

Main P.C.B. Ass'y (SU-1103A) Parts List

Resistors

Symbol	Description	Part Number
R1406	V R 200Ω	QVZ3230-022
R1408	V R 200Ω	QVZ3230-022
R1410	CMF R 6.8Ω1W J	QRX019J-6R8
R1414	OM R 3.3KΩ1W J	QRG019J-332
R1415	OM R 2.7KΩ1W J	QRG019J-272
R1421	OM R 12KΩ2W J	QRG029J-123
R1422	V R 10KΩ	QVZ3224-014H
⚠FR1401	⚠F R 68Ω2W K	QRH024K-680M
⚠R1503	⚠CMF R 11.8KΩ¼W +1%	QRV142F-1182
R1504	V R 5KΩ	QVZ3230-053
R1509	OM R 10KΩ2W J	QRG029J-103
R1511	OM R 5.6KΩ2W J	QRG029J-562
R1514	OM R 680Ω2W J	QRG029J-681
R1515	CMF R 8.2Ω1W J	QRX019J-8R2
R1522	CMF R 4.7Ω1W J	QRX019J-4R7
R1523	OM R 56Ω2W J	ORG029J-560
R1528	OM R 390Ω1W J	ORG019J-391
R1534	ZN R	ERZ-C05ZK471
VR1501	ZN R	ERZ-C05DK271
⚠R1703	⚠CMF R 39KΩ½W +1%	QRV122F-3902
⚠R1704	⚠CMF R 7.68KΩ¼W +1%	QRV142F-7681
⚠R1901	⚠Posistor	A75414
R1902	UNF R 2Ω7W K	QRF076K-2R0
R1903	CMF R 5.6Ω3W J	QRX039J-5R6
R1904	OM R 10KΩ2W J	QRG026J-103Z
⚠FR1901	⚠F R 220Ω½W K	QRH124K-221M

Capacitors

Symbol	Description	Part Number
C1402	Tan. Cap. 2.2uF 16V K	QEE51CK-225B
C1411	E Cap. 100uF 160V A	QEW52CA-107
C1412	E Cap. 3.3uF 160V A	QEW52CA-335
C1508	PP Cap. 5600pF 50V J	QFP31HJ-562
C1511	E Cap. 47uF 160V A	QEW52CA-476S
⚠C1512	⚠PP Cap. 2000pF DC1500V J	QFZ0082-202
⚠C1513	⚠PP Cap. 2000pF DC1500V J	QFZ0082-202
⚠C1514	⚠PP Cap. 2500pF DC1500V J	QFZ0082-252
C1515	PP Cap. 0.53uF DC1200V K	QFZ0067-534
C1520	BPE Cap. 1uF 50V A	QEN61HA-105Z
C1524	M Cap. 0.1uF 200V K	QFM72DK-682M
C1904	E Cap.	QEY0034-001
C1905	E Cap. 10uF 250V A	QEW52EA-106
⚠C1907	⚠MM Cap. 0.1uF AC150V Z	QFZ9008-104

Coils

Symbol	Description	Part Number
L1501	Peaking Coil	A75360-6
L1502	Liniarty Coil	A39934
L1503	Width Coil	C30380-A
L1504	Heater Choke	C30333-A
L1901	Line Filter	A39475-J

Transformers

Symbol	Description	Part Number
T1501	Hor. Drive Transf.	A46022-BM
T1503	Side Pin Transf.	C39050-A

Semiconductors

Symbol	Description	Part Number
IC1501	I.C.	HA11244
X1101	Si. Transistor	2SC1685(R)
X1102	Si. Transistor	2SA673(C)
X1103	Si. Transistor	2SC1685(R)
X1104	Si. Transistor	2SA673(C)
X1105	Si. Transistor	2SC1685(R)
X1106	Si. Transistor	2SA673(C)
X1301	Si. Transistor	2SC1685(R)
X1302	Si. Transistor	2SC1685(R)
X1303	Si. Transistor	2SA673(C)
X1304	Si. Transistor	2SC1685(R)
X1305	Si. Transistor	2SC1685(R)
X1401	Si. Transistor	2SD478
X1402	Si. Transistor	2SD478
X1501	Si. Transistor	2SC2610BK
X1701	Si. Transistor	2SC1685(P-S)
D1101	Si. Diode	W06A
D1102	Si. Diode	W06A
D1103	Si. Diode	W06A
D1301	Si. Diode	1S2473H
D1401	Si. Diode	1S2473H
D1402	Zener Diode	RD10F(C)
D1503	Si. Diode	HF-1
D1504	Si. Diode	V09E
D1505	Zener Diode	RD11E(B)
D1506	Si. Diode	W06A
D1507	Si. Diode	1SS81
D1508	Si. Diode	1S2473H
⚠D1701	⚠Zener Diode	RD20EV2
⚠D1901	⚠Si. Diode	1S1887A
⚠D1902	⚠Si. Diode	1S1887A
⚠D1903	⚠Si. Diode	1S1887A
⚠D1904	⚠Si. Diode	1S1887A

Miscellaneous

Symbol	Description	Part Number
⚠F1901	⚠Fuse 1A	QMF53U1-1R0S
⚠F1902	⚠UL Fuse 3A	QMF66U1-3R0S

CRT Socket P.C.B. Ass'y (SU-3016A) Parts List

Resistors

Symbol	Description	Part Number
R3105	V R 200Ω	QVZ3234-022
R3106	V R 200Ω	QVZ3234-022
R3113	V R 5KΩ	QVZ3234-053
R3114	V R 5KΩ	QVZ3234-053
R3115	V R 5KΩ	QVZ3234-053
R3116	OM R 10KΩ2W J	QRG029J-103
R3117	OM R 10KΩ2W J	QRG029J-103
R3118	OM R 10KΩ2W J	QRG029J-103
R3119	Comp. R 3.3KΩ½W K	QRZ0039-332
R3120	Comp. R 3.3KΩ½W K	QRZ0039-332
R3121	Comp. R 3.3KΩ½W K	QRZ0039-332

Capacitors

Symbol	Description	Part Number
C3107	E Cap. 10uF 250V A	QEW52EA-106
C3108	C Cap. 1000pF DC1400V P	QCZ9001-102M

Coils

Symbol	Description	Part Number
L3101	Peaking coil	QQL043K-101

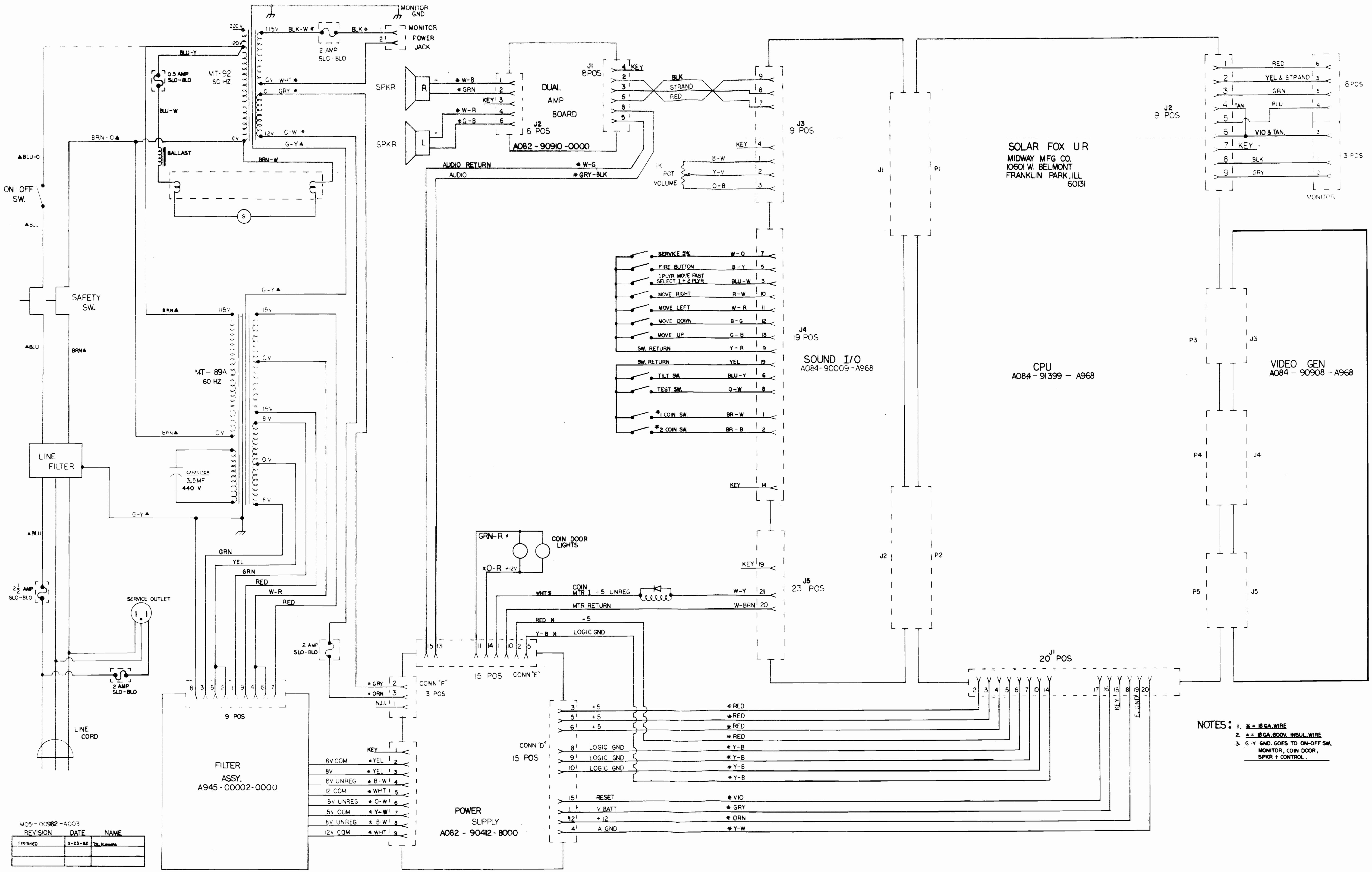
Semiconductors

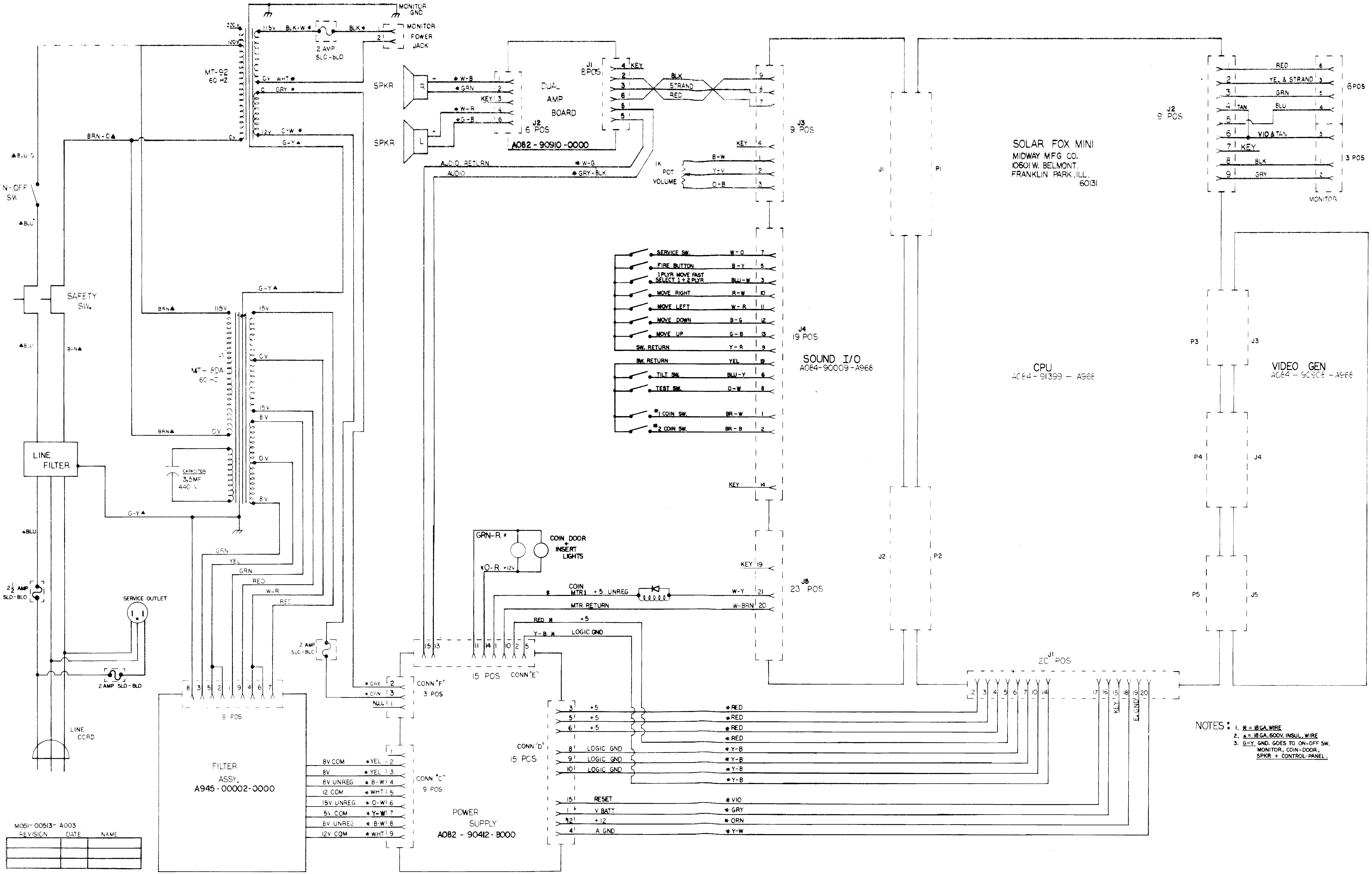
Symbol	Description	Part Number
X3101	Si. Transistor	2SC2611
X3102	Si. Transistor	2SC2611
X3103	Si. Transistor	2SC2611

Miscellaneous

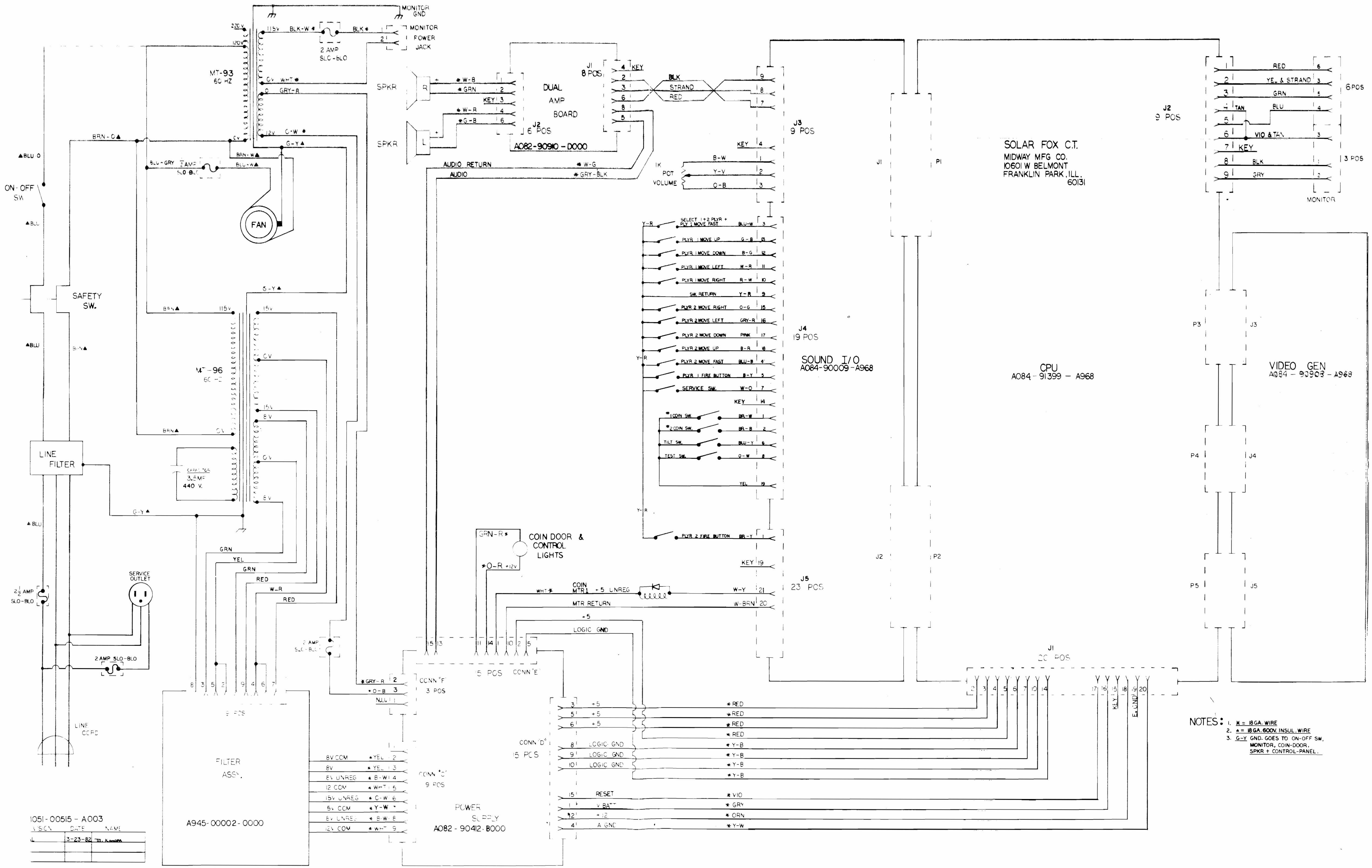
Symbol	Description	Part Number
⚠	⚠CRT Socket	A75522

IX Schematics and Wiring Diagrams


SOLAR FOX U R
MIDWAY MFG CO.
10601 W. BELMONT
FRANKLIN PARK, ILL
60131
MONITOR GND
MONITOR POWER JACK
2 AMP SLO-BLO
0.5 AMP SLO-BLO
MT-92 60 HZ
BALLAST
ON-OFF SW.
SAFETY SW.
MT-89A 60 HZ
CAPACITOR 3.5MF 440 V.
LINE FILTER
2½ AMP SLO-BLO
SERVICE OUTLET
2 AMP SLO-BLO
LINE CORD
SPKR
DUAL AMP BOARD
J1 8 POS.
J2 6 POS
A082-90910-0000
AUDIO RETURN
AUDIO
1K POT VOLUME
J3 9 POS
SERVICE SW.
FIRE BUTTON
1 PLYR MOVE FAST SELECT 1+2 PLYR
MOVE RIGHT
MOVE LEFT
MOVE DOWN
MOVE UP
SW. RETURN
TILT SW.
TEST SW.
#1 COIN SW.
#2 COIN SW.
J4 19 POS
SOUND I/O
A084-90009-A968
COIN DOOR LIGHTS
COIN MTR 1 +5 UNREG
MTR RETURN
LOGIC GND
J5 23 POS
CPU
A084-91399 - A968
VIDEO GEN
A084-90908 -A968
J2 9 POS
6 POS
3 POS
MONITOR
20 J1 POS
15 POS CONN "E"
CONN "F" 3 POS
CONN "D" 15 POS
RESET
V BATT
+12
A GND
POWER SUPPLY
A082-90412-8000
9 POS
FILTER ASSY.
A945-00002-0000
8V COM
8V
8V UNREG
12 COM
15V UNREG
5V COM
6V UNREG
12V COM
NOTES: 1. ✱ = 18 GA. WIRE
2. ▲ = 18 GA. 600V. INSUL. WIRE
3. G-Y GND. GOES TO ON-OFF SW., MONITOR, COIN DOOR, SPKR + CONTROL.
M051-00982-A003
REVISION DATE NAME
FINISHED 3-23-82



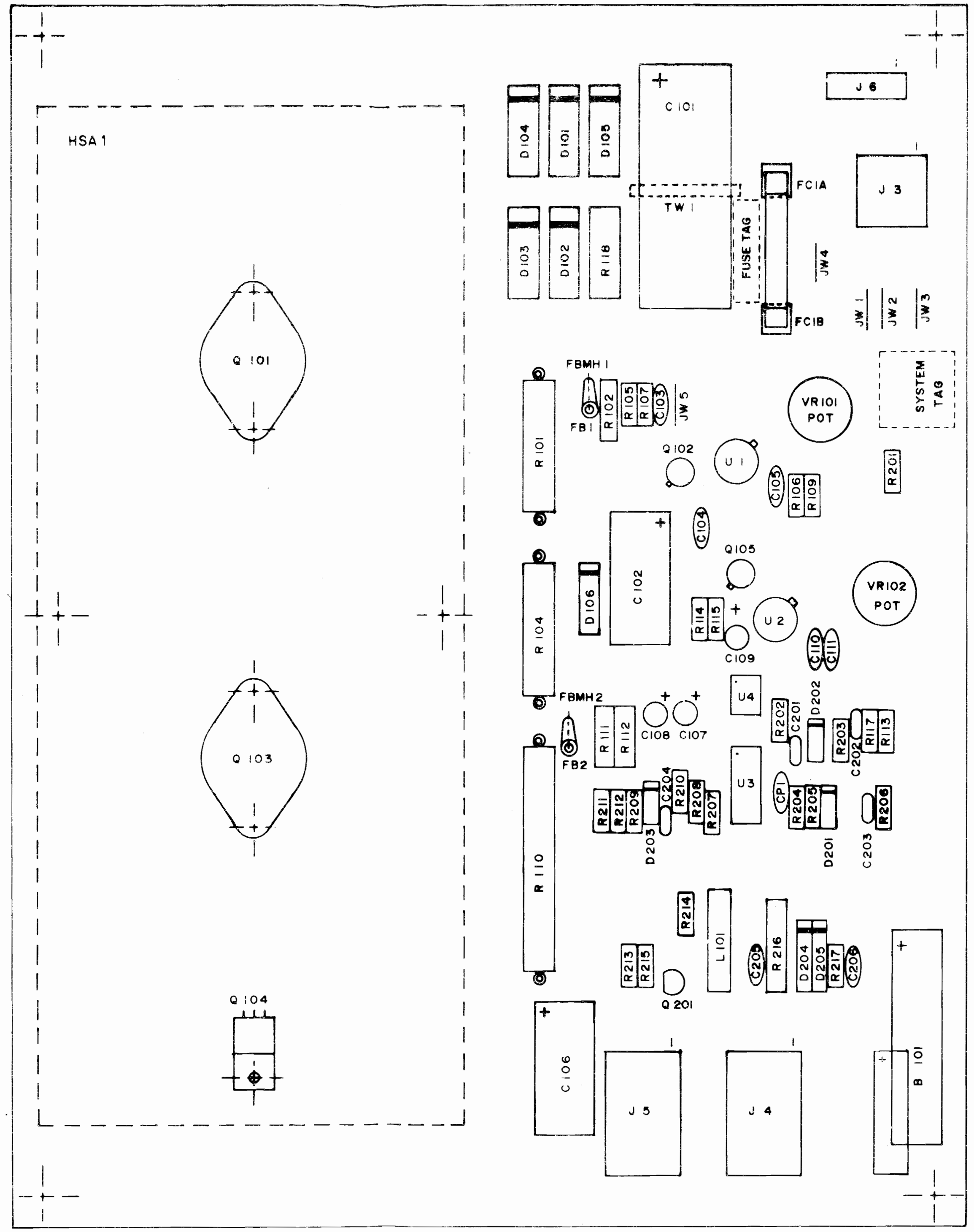
SOLAR FOX MINI
MIDWAY MFG CO.
10601 W. BELMONT.
FRANKLIN PARK, ILL.
60131
MONITOR GND
MONITOR POWER JACK
2 AMP SLO-BLO
MT-92 60 HZ
SPKR
DUAL AMP BOARD
J2 6 POS
J1 8 POS
A082-90910-0000
AUDIO RETURN
AUDIO
1K POT VOLUME
J3 9 POS
ON-OFF SW.
SAFETY SW.
MT-80A 60 HZ
CAPACITOR 3.5MF 440 V
LINE FILTER
2 1/2 AMP SLO-BLO
SERVICE OUTLET
2 AMP SLO-BLO
LINE CORD
SERVICE SW.
FIRE BUTTON
1 PLYR MOVE FAST SELECT 1 + 2 PLYR
MOVE RIGHT
MOVE LEFT
MOVE DOWN
MOVE UP
SW. RETURN
TILT SW.
TEST SW.
1 COIN SW.
2 COIN SW.
J4 19 POS
SOUND I/O
A084-90009-A968
CPU
A084-91399-A968
VIDEO GEN
A084-90908-A968
J2 9 POS
6 POS
3 POS
MONITOR
COIN DOOR + INSERT LIGHTS
COIN MTR
MTR RETURN
LOGIC GND
J5 23 POS
J1 20 POS
15 POS
CONN "E"
CONN "F" 3 POS
CONN "C" 9 POS
CONN "D" 15 POS
FILTER ASSY. A945-00002-0000
9 POS
POWER SUPPLY A082-90412-B000
RESET
V BATT
A GND
NOTES:
1. * = 18 GA. WIRE
2. ▲ = 18 GA. 600V. INSUL. WIRE
3. G-Y GND. GOES TO ON-OFF SW. MONITOR, COIN-DOOR, SPKR + CONTROL-PANEL.
M051-00513-A003
REVISION
DATE
NAME


SOLAR FOX C.T.
MIDWAY MFG. CO.
10601 W BELMONT
FRANKLIN PARK, ILL.
60131
MONITOR GND
MONITOR POWER JACK
2 AMP SLO-BLO
MT-93 60 HZ
FAN
SPKR
DUAL AMP BOARD
A082-90910-0000
J1 8 POS
J2 6 POS
AUDIO RETURN
AUDIO
1K POT VOLUME
ON-OFF SW.
SAFETY SW.
MT-96 60 HZ
LINE FILTER
CAPACITOR 3.5MF 440 V.
SERVICE OUTLET
2½ AMP SLO-BLO
LINE CORD
J3 9 POS
J4 19 POS
J5 23 POS
SOUND I/O
A084-90009-A968
CPU
A084-91399 - A968
VIDEO GEN
A084-90903-A968
J2 9 POS
6 POS
3 POS
MONITOR
SELECT 1+2 PLYR + PLY 1 MOVE FAST
PLYR 1 MOVE UP
PLYR 1 MOVE DOWN
PLYR 1 MOVE LEFT
PLYR 1 MOVE RIGHT
SW. RETURN
PLYR 2 MOVE RIGHT
PLYR 2 MOVE LEFT
PLYR 2 MOVE DOWN
PLYR 2 MOVE UP
PLYR 2 MOVE FAST
PLYR 1 FIRE BUTTON
SERVICE SW.
1 COIN SW.
2 COIN SW.
TILT SW.
TEST SW.
PLYR 2 FIRE BUTTON
COIN DOOR & CONTROL LIGHTS
COIN MTR
+5 UNREG
MTR RETURN
LOGIC GND
J1 20 POS
CONN "F" 3 POS
5 POS CONN "E"
CONN "D" 15 POS
CONN "C" 9 POS
POWER SUPPLY
A082-90412-B000
FILTER ASSY.
A945-00002-0000
8 POS
RESET
V BATT
A GND
NOTES: 1. ✱ = 18GA. WIRE
2. ▲ = 18GA. 600V INSUL. WIRE
3. G-Y GND. GOES TO ON-OFF SW., MONITOR, COIN-DOOR, SPKR + CONTROL-PANEL.
1051-00515-A003
3-23-82

DESIGNATION LIST

DESIGNATION #	DESCRIPTION
C101	4700uf AX. ELECT.
C102	470uf AX. ELECT.
C103	.1uf AX. CER.
C104	.1uf AX. CER.
C105	47pf AX. CER.
C106	470uf AX. ELECT.
C107	100uf RD. TANT.
C108	1uf RD. TANT.
C109	4.7uf RD. TANT.
C110	.1uf AX. CER.
C111	.1uf AX. CER.
C201	.01uf MYLAR
C202	.033uf MYLAR
C203	.01uf MYLAR
C204	.047uf MYLAR
C205	820pf AX. CER.
C206	.01uf AX. CER.
CP1	.1uf AX. CER.
R101	.18ohm 5W W/RES. SPACER
R102	68ohm 1/2W 5%
R104	10ohm 5W W/RES. SPACER
R105	27ohm 1/4W 5%
R106	270ohm 1/4W 5%
R107	6.2K 1/4W 5%
R109	1K 1/4W 5%
R110	.16ohm 15W W/RES. SPACER
R111	6.8ohm 1/2W5%
R112	68ohm 1/2W 5%
R113	1.2K 1/4W 5%
R114	47ohm 1/4W 5%
R115	160ohm 1/4W 5%
R117	560ohm 1/4W 5%
R118	150ohm 2W
R201	270ohm 1/4W 5%
R202	1.2K 1/4W 5%
R203	1.1M 1/4W 5%
R204	3.3M 1/4W 5%
R205	10M 1/4W 5%
R206	100K 1/4W 5%
R207	33K 1/4W 5%
R208	2M 1/4W 5%
R209	1M 1/4W 5%
R210	1.2M 1/4W 5%
R211	75K 1/4W 5%
R212	75K 1/4W 5%
R213	220K 1/4W 5%
R214	3.9K 1/4W 5%
R215	1.2K 1/4W 5%
R216	82ohm 1W 10%
R217	270ohm 1/4W 5%
VR101,102	100ohm POT
D101	A15F
D102	A15F
D103	A15F
D104	A15F
D105	A15F
D106	1N4001
D201	1N4148
D202	1N4148
D203	1N4148
D204	1N4001
D205	1N4001

DESIGNATION #	DESCRIPTION
Q102	2N2905
Q105	2N2905
Q201	2N4401
U1	LM305 REG.
U2	LM305 REG.
U3	LM3900
U4	4N28
L101	.22uH INDUCTOR
B101	BATTERY 3.6VDC 60DEG-C
F1	3/8A S-BLO FUSE
FC1A,1B	FUSE CLIP
FB1,2	FERRITE BEAD
TW1	TIE WRAP
J3	9PIN P.C. MOUNT CONN.(MALE)
J4	15PIN P.C. MOUNT CONN.(FEMALE)
J5	15PIN P.C. MOUNT CONN.(MALE)
J6	3PIN P.C. MOUNT CONN.(MALE)
LB1	FUSE TAG
LB2	SYSTEM TAG
HSA1	HEAT SINK ASS'Y 1
MHHSA1	MOUNTING HARD WARE(HEAT SINK)
	2-SCREW
	4-WASHER
	2-HEXNUT
JW1-5	JUMPER WIRE
FBMH1,2	FERRITE BEAD MOUNTING HARDWARE



CROSS REFFERENCE LIST

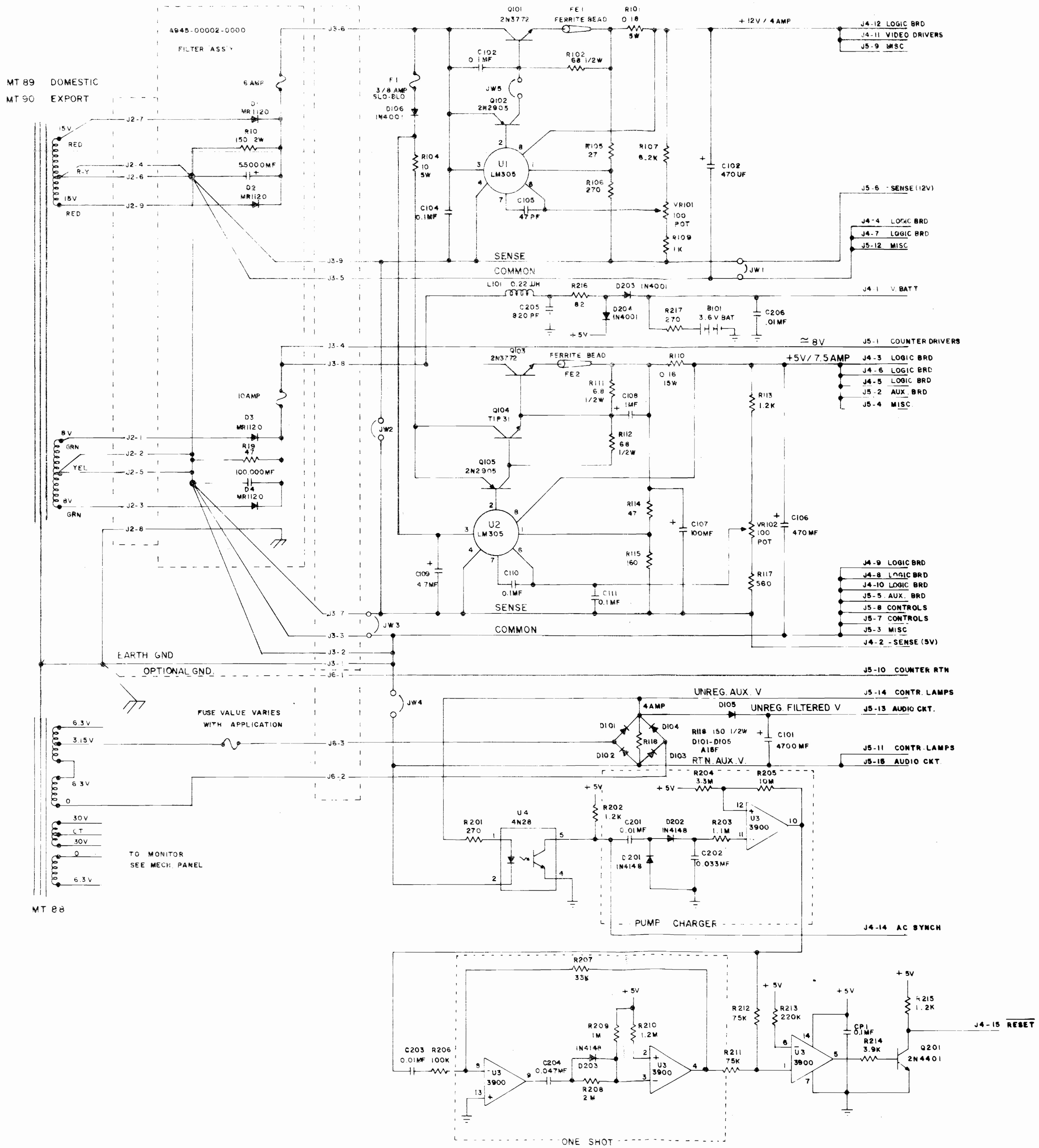
DESCRIPTION	Q'ty	DESIGNATION #	PART #
3PIN P.C. MOUNT CONN. (MALE)	1	J6	0017-00021-0443
9PIN P.C. MOUNT CONN.(MALE)	1	J3	0017-00021-0425
15PIN P.C. MOUNT CONN.(FEMALE)	1	J4	0017-00021-0441
15PIN P.C. MOUNT CONN.(MALE)	1	J5	0017-00021-0440
22 AWG T & R BARE 2.5"	5	JW1-5	0151-00087-0000

CROSS REFFERENCE LIST

DESCRIPTION	Q'ty	DESIGNATION #	PART #
47pf AX. CER.	1	C105	0945-00811-0100
820pf AX. CER.	1	C205	0945-00816-0400
.01uf AX. CER	1	C206	0945-00816-0100
.01uf MYLAR	2	C201,203	0945-00816-0200
.033uf MYLAR	1	C202	0945-00816-0500
.047uf MYLAR	1	C204	0945-00816-0300
.1uf AX. CER.	5	C103,104,110,111, CP1	0945-00811-0200
1uf RAD. TANT	1	C108	0945-00811-0300
4.7uf RAD. TANT	1	C109	0945-00811-0400
100uf RAD. TANT	1	C107	0945-00811-0500
470uf AX. ELECT.	2	C102,106	0945-00816-0600
4700uf AX. ELECT.	1	C101	0945-00811-0700
.16ohm 15W 5%	1	R110	0945-00815-0100
.18ohm 5W 5%	1	R101	0945-00815-0200
6.8ohm 1/2W 5%	1	R111	0062-047D3-1XXX
10ohm 5W 5%	1	R104	0945-00812-0100
27ohm 1/4W 5%	1	R105	0062-068B3-1XXX
47ohm 1/4W 5%	1	R114	0062-086B3-1XXX
68ohm 1/2W 5%	2	R102,112	0062-098D3-1XXX
82ohm 1W 10%	1	R216	0062-104F5-1XXX
150ohm 2W 5%	1	R118	0945-00812-0200
160ohm 1/4W 5%	1	R115	0062-124B3-1XXX
270ohm 1/4W 5%	3	R106,201,217.	0062-138B3-1XXX
560ohm 1/4W 5%	1	R117	0062-162B3-1XXX
1K 1/4W 5%	1	R109	0062-179B3-1XXX
1.2K 1/4W 5%	3	R113,202,215	0062-183B3-1XXX
3.9K 1/4W 5%	1	R214	0062-207B3-1XXX
6.2K 1/4W 5%	1	R107	0062-217B3-1XXX
33K 1/4W 5%	1	R207	0062-251B3-1XXX
75K 1/4W 5%	2	R211,212	0062-269B3-1XXX
100K 1/4W 5%	1	R206	0062-275B3-1XXX
220K 1/4W 5%	1	R213	0062-291B3-1XXX
1M 1/4W 5%	1	R209	0062-323B3-1XXX
1.1M 1/4W 5%	1	R203	0062-325B3-1XXX
1.2M 1/4W 5%	1	R210	0062-327B3-1XXX
2M 1/4W 5%	1	R208	0062-337B3-1XXX
3.3M 1/4W 5%	1	R204	0062-347B3-1XXX
10M 1/4W 5%	1	R205	0062-371B3-1XXX
100ohm POT	2	VR101,102	0945-00814-0000
A15F RECTIFIER	5	D101-105	0945-00804-0200
1N4001	3	D106,204,205	0945-00804-0300
1N4148	3	D201-203	0945-00804-0500
2N2905	2	Q102,105	0945-00808-0300
2N4401	1	Q201	0945-00804-0400
LM305 REG.	2	U1,2	0945-00813-0100
LM3900	1	U3	0945-00813-0200
4N28	1	U4	0945-00813-0300
BATTERY 3.6VDC 60DEG-C	1	B101	0017-00003-0377
FUSE 3/8A S-BLO	1	F1	0945-00808-0400
FUSE CLIP	2	FC1A,1B	0017-00003-0214
TIE WRAP	1	TW1	0945-00814-0300
FERRITE BEAD	2	FB1,2	0017-00009-0225
FERRITE MOUNTING HDW.	2	FBMH1,2	0017-00033-0139
.22uH INDUCTOR	1	L101	0945-00814-0200
FUSE TAG	1		M051-00945-A004
SYSTEM TAG	1		M051-00945-A009
P.C.B.	1		A080-90412-B000
HEAT SINK ASS'Y (SEE HS ASS'Y DRAWING "** NOTE")	1	HSA1	A945-00008-0000
** 4-40 X 10 SLT RND	2	MH HSA 1A, 2A.	0017-00101-00727
** 4-40 HEX NUT	2	MH HSA 1E, 2E.	0017-00103-0002
** WSH 4-120-.250-018	4	MH HSA 1B,1D MH HSA 2B,2D	0017-00104-0071

PROJ. ENG : L. DEKKER

DO NOT SCALE DWG	HEAT TREAT	SCALE	USED ON KICK NO REQ'D 1PER	MIDWAY MFG. CO. FRANKLIN PK ILL
DIM TOLERANCES UNLESS SPECIFIED CONCENTRICITY T.I.R. .003 FRACTIONAL 1/64 DECIMAL .005 HOLE DIA + .002 .000	DRN C.L CKD L.D. DATE 12-14-81	MAT'L FINISH	PWR SPLY 125VA W/CKT SPRT A082-90412-B000	PART NO M051-00945-C006



PROJECT ENG. L. DEKKER

12-14-81

FULL

MCR II

SCHEMATIC DRAWING
125VA POWER SUPPLY
A082-90412-B000

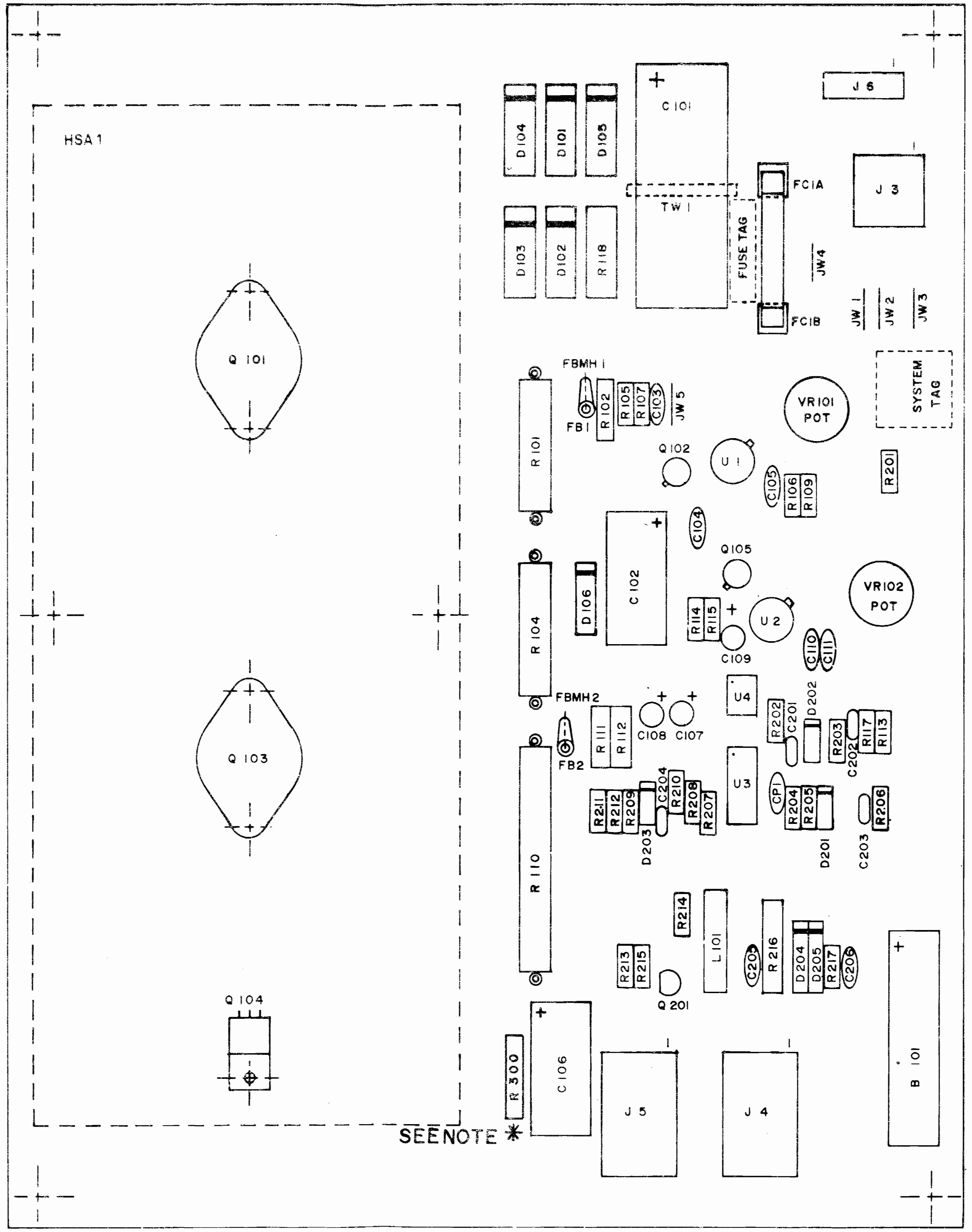
MIDWAY MFG. CO.

M051-0945-C007

DESIGNATION LIST

DESIGNATION #	DESCRIPTION
C101	4700uf AX. ELECT.
C102	470uf AX. ELECT.
C103	.1uf AX. CER.
C104	.1uf AX. CER.
C105	47pf AX. CER.
C106	470uf AX. ELECT.
C107	100uf RD. TANT.
C108	1uf RD. TANT.
C109	4.7uf RD. TANT.
C110	.1uf AX. CER.
C111	.1uf AX. CER.
C201	.01uf MYLAR
C202	.033uf MYLAR
C203	.01uf MYLAR
C204	.047uf MYLAR
C205	820pf AX. CER.
C206	.01uf AX. CER.
CP1	.1uf AX. CER.
R101	.18ohm 5W W/RES. SPACER
R102	68ohm 1/2W 5%
R104	10ohm 5W W/RES. SPACER
R105	27ohm 1/4W 5%
R106	270ohm 1/4W 5%
R107	6.2K 1/4W 5%
R109	1K 1/4W 5%
R110	.16ohm 15W W/RES. SPACER
R111	6.8ohm 1/2W5%
R112	68ohm 1/2W 5%
R113	1.2K 1/4W 5%
R114	47ohm 1/4W 5%
R115	160ohm 1/4W 5%
R117	560ohm 1/4W 5%
R118	150ohm 2W
R201	270ohm 1/4W 5%
R202	1.2K 1/4W 5%
R203	1.1M 1/4W 5%
R204	3.3M 1/4W 5%
R205	10M 1/4W 5%
R206	100K 1/4W 5%
R207	33K 1/4W 5%
R208	2M 1/4W 5%
R209	1M 1/4W 5%
R210	1.2M 1/4W 5%
R211	75K 1/4W 5%
R212	75K 1/4W 5%
R213	220K 1/4W 5%
R214	3.9K 1/4W 5%
R215	1.2K 1/4W 5%
R216	82ohm 1W 10%
R217	270ohm 1/4W 5%
R300	68 " 1/2W5%
VR101,102	100ohm POT
D101	A15F
D102	A15F
D103	A15F
D104	A15F
D105	A15F
D106	1N4001
D201	1N4148
D202	1N4148
D203	1N4148
D204	1N4001
D205	1N4001

DESIGNATION #	DESCRIPTION
Q102	2N2905
Q105	2N2905
Q201	2N4401
U1	LM305 REG.
U2	LM305 REG.
U3	LM3900
U4	4N28
L101	.22uH INDUCTOR
B101	BATTERY 3.6VDC 60DEG-C
F1	3/8A S-BLO FUSE
FC1A,1B	FUSE CLIP
FE 1,2	FERRITE BEAD
TW1	TIE WRAP
J3	9PIN P.C. MOUNT CONN.(MALE)
J4	15PIN P.C. MOUNT CONN.(FEMALE)
J5	15PIN P.C. MOUNT CONN.(MALE)
J6	3PIN P.C. MOUNT CONN.(MALE)
LB1	FUSE TAG
LB2	SYSTEM TAG
HSA1	HEAT SINK ASS'Y 1
MHHSA1	MOUNTING HARD WARE(HEAT SINK)
	2-SCREW
	4-WASHER
	2-HEXNUT
JW1-5	JUMPER WIRE
FBMH1,2	FERRITE BEAD MOUNTING HARDWARE



CROSS REFFERENCE LIST

DESCRIPTION	Q'ty	DESIGNATION #	PART #
3PIN P.C. MOUNT CONN. (MALE)	1	J6	0017-00021-0443
9PIN P.C. MOUNT CONN.(MALE)	1	J3	0017-00021-0425
15PIN P.C. MOUNT CONN.(FEMALE)	1	J4	0017-00021-0441
15PIN P.C. MOUNT CONN.(MALE)	1	J5	0017-00021-0440
22 AWG T & R BARE 2.5"	5	JW1-5	0151-00087-0000

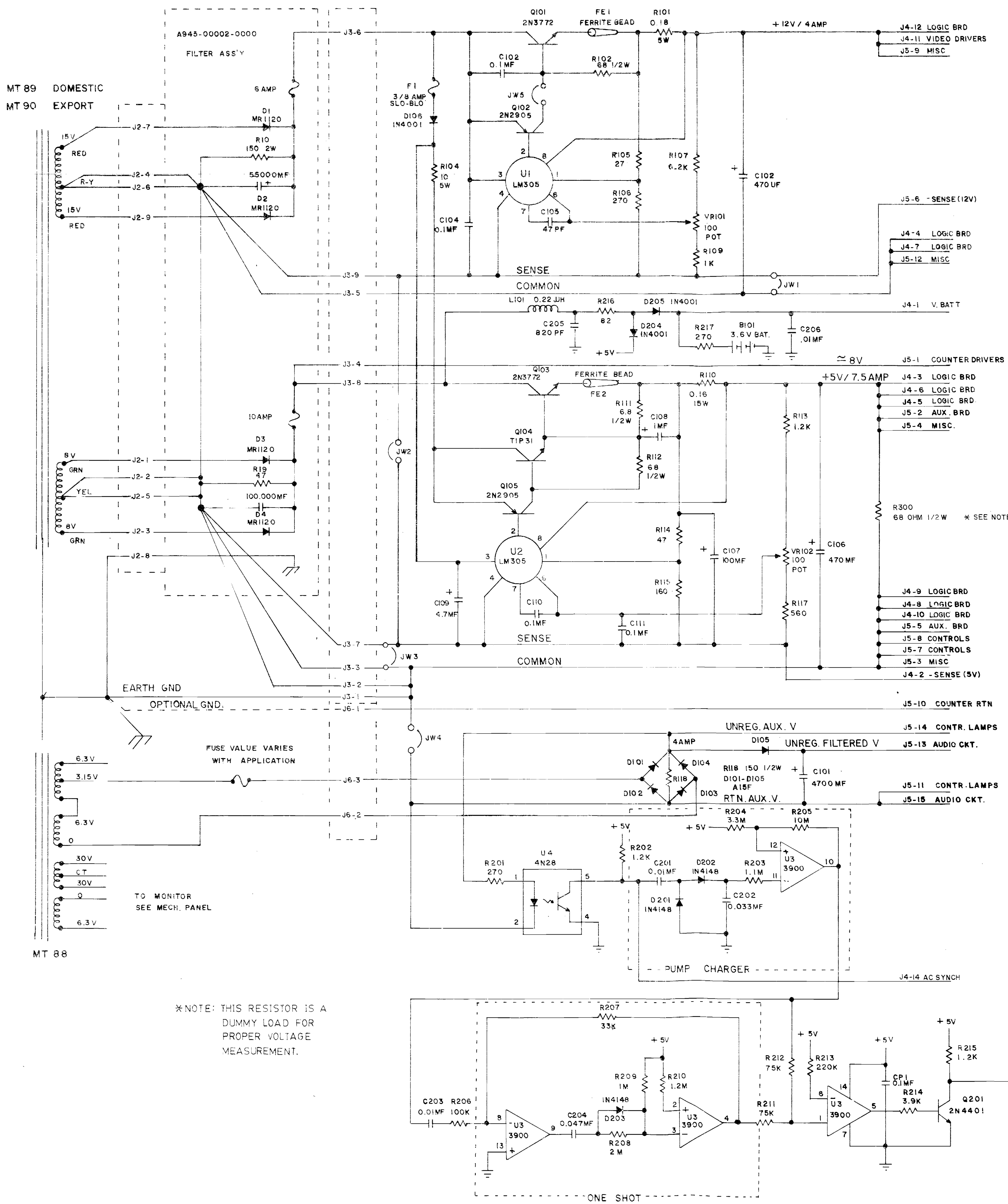
CROSS REFFERENCE LIST

DESCRIPTION	Q'ty	DESIGNATION #	PART #
47pf AX. CER.	1	C105	0945-00811-0100
820pf AX. CER.	1	C205	0945-00816-0400
.01uf AX. CER	1	C206	0945-00816-0100
.01uf MYLAR	2	C201,203	0945-00816-0200
.033uf MYLAR	1	C202	0945-00816-0500
.047uf MYLAR	1	C204	0945-00816-0300
.1uf AX. CER.	5	C103,104,110,111, CP1	0945-00811-0200
1uf RAD. TANT	1	C108	0945-00811-0300
4.7uf RAD. TANT	1	C109	0945-00811-0400
100uf RAD. TANT	1	C107	0945-00811-0500
470uf AX. ELECT.	2	C102,106	0945-00816-0600
4700uf AX. ELECT.	1	C101	0945-00811-0700
.16ohm 15W 5%	1	R110	0945-00815-0100
.18ohm 5W 5%	1	R101	0945-00815-0200
6.8ohm 1/2W 5%	1	R111	0062-047D3-1XXX
10ohm 5W 5%	1	R104	0945-00812-0100
27ohm 1/4W 5%	1	R105	0062-068B3-1XXX
47ohm 1/4W 5%	1	R114	0062-086B3-1XXX
68ohm 1/2W 5%	3	R102,112,R300	0062-098D3-1XXX
82ohm 1W 10%	1	R216	0062-104F5-1XXX
150ohm 2W 5%	1	R118	0945-00812-0200
160ohm 1/4W 5%	1	R115	0062-124B3-1XXX
270ohm 1/4W 5%	3	R106,201,217.	0062-138B3-1XXX
560ohm 1/4W 5%	1	R117	0062-162B3-1XXX
1K 1/4W 5%	1	R109	0062-179B3-1XXX
1.2K 1/4W 5%	3	R113,202,215	0062-183B3-1XXX
3.9K 1/4W 5%	1	R214	0062-207B3-1XXX
6.2K 1/4W 5%	1	R107	0062-217B3-1XXX
33K 1/4W 5%	1	R207	0062-251B3-1XXX
75K 1/4W 5%	2	R211,212	0062-269B3-1XXX
100K 1/4W 5%	1	R206	0062-275B3-1XXX
220K 1/4W 5%	1	R213	0062-291B3-1XXX
1M 1/4W 5%	1	R209	0062-323B3-1XXX
1.1M 1/4W 5%	1	R203	0062-325B3-1XXX
1.2M 1/4W 5%	1	R210	0062-327B3-1XXX
2M 1/4W 5%	1	R208	0062-337B3-1XXX
3.3M 1/4W 5%	1	R204	0062-347B3-1XXX
10M 1/4W 5%	1	R205	0062-371B3-1XXX
100ohm POT	2	VR101,102	0945-00814-0000
A15F RECTIFIER	5	D101-105	0945-00804-0200
1N4001	3	D106,204,205	0945-00804-0300
1N4148	3	D201-203	0945-00804-0500
2N2905	2	Q102,105	0945-00808-0300
2N4401	1	Q201	0945-00804-0400
LM305 REG.	2	U1,2	0945-00813-0100
LM3900	1	U3	0945-00813-0200
4N28	1	U4	0945-00813-0300
BATTERY 3.6VDC 60DEG-C	1	B101	0017-00003-0377
FUSE 3/8A S-BLO	1	F1	0945-00808-0400
FUSE CLIP	2	FC1A,1B	0017-00003-0214
TIE WRAP	1	TW1	0945-00814-0300
FERRITE BEAD	2	FB1,2	0017-00009-0225
FERRITE MOUNTING HDW.	2	FBMH1,2	0017-00033-0139
.22uH INDUCTOR	1	L101	0945-00814-0200
FUSE TAG	1		M051-00945-A004
SYSTEM TAG	1		M051-00945-A009
P.C.B.	1		A080-90412-B000
HEAT SINK ASS'Y (SEE HS ASS'Y DRAWING "** NOTE")	1	HSA1	A945-00008-0000
** 4-40X10 SLT RND	2	MH HSA1A,2A.	0017-00101-00727
** 4-40 HEX NUT	2	MH HSA1E, 2E.	0017-00103-0002
** WSH 4-120-.250-018	4	MH HSA1B,1D MH HSA2B,2D	0017-00104-0071

*NOTE: THIS RESISTOR MUST BE IN CIRCUIT FOR PROPER OPERATION.

PROJ. ENG : L. DEKKER

DO NOT SCALE DWG	HEAT TREAT	SCALE	USED ON TRON	MIDWAY MFG. CO. FRANKLIN PK ILL
DIM TOLERANCES UNLESS SPECIFIED; CONCENTRICITY T.I.R. .001; FRACTIONAL ± 1/64; DECIMAL ± .005; HOLE DIA + .002 .000 — DRN C.L. / CKD L.D. / DATE 5/4/82	MAT'L / FINISH	ASSEMBLY DRAWING PWR SPLY 125VA W/CKT SPRT A082-90412-C000	NO REQ'D 1PER	PART NO M051-00945-C006



PROJECT ENG: L. DEKKER

DO NOT SCALE DWG

SCALE: FULL

USED ON: SOLARFOX

NO. REQ'D: 1 PER.

MIDWAY MFG. CO.
FRANKLIN PK. ILL.

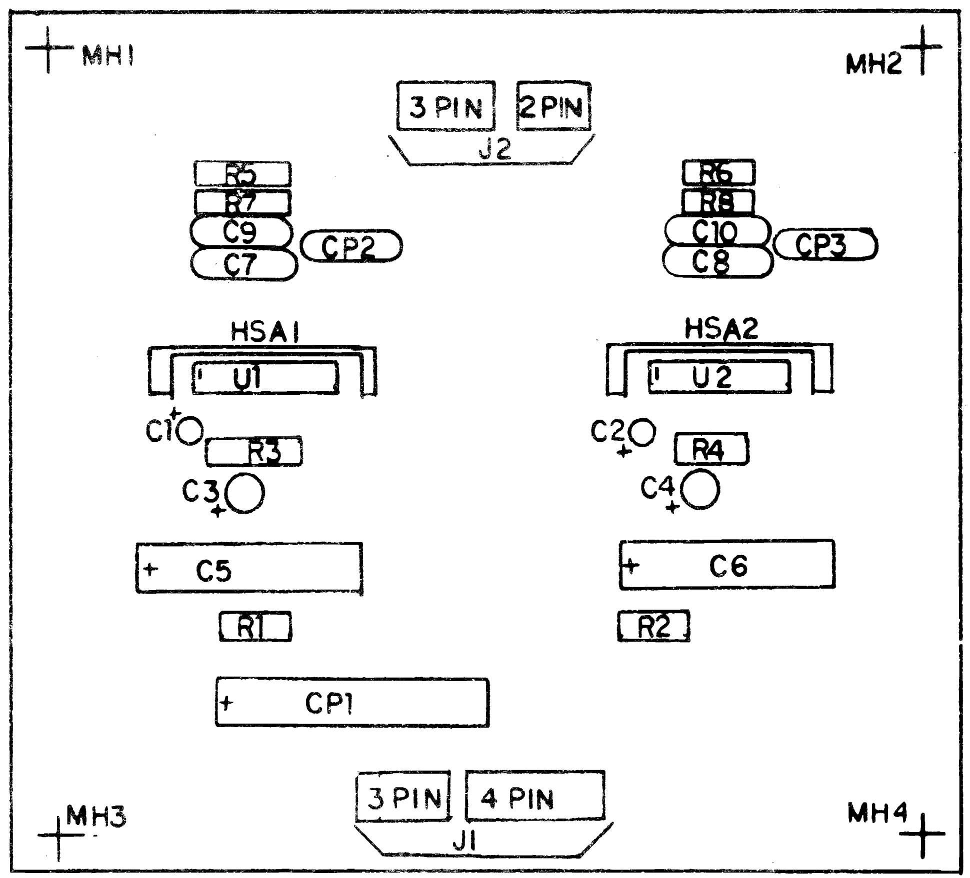
POWER SUPPLY 125VA W/CKT SUPORT A082-90412-C000

M051 -00945 -C007

8/17/82

DESIGNATION LIST

DESIGNATION	DESCRIPTION
C1,C2	4.7mf 25v rd.tant.
C3,C4	22mf 6v " "
C5,C6	470mf 6v ax.elect.
C7-C10	.1mf 50v ax.cr.
CP1	220mf 25v ax.elect.
CP2,CP3	.1mf 50v ax.cr.
R1,R2	2.7KΩ 1/4w 5% .CRBN.
R3,R4	27Ω " " "
R5-R8	1Ω 1/2w " "
U1,U2	MB3730
J1	3 PIN STRT. KK156 4 " " "
J2	3 " " " 2 " " "
HSA1,2	HEATSINK ASSY.
MH1-MH4	HEYCO BUSHING



CROSS REFERENCE LIST

DESCRIPTION	QTY	DESIGNATION	PART NO.
.1mf 50v ax.cr.	6	C7-C10, CP2,CP3	0986-00800-1100
4.7mf 25v rd.tant.	2	C1,C2	0986-00800-3100
22mf 6v " "	2	C3,C4	0986-00800-1600
220mf 25v ax.elec.	1	CP1	0986-00800-3200
470mf 6v " "	2	C5,C6	0986-00800-1700
1Ω 1/2w 5%	4	R5-R8	0062-026D3-1XXX
27Ω 1/4w "	2	R3,R4	0062-068B3-1XXX
2.7K " "	2	R1,R2	0062-199B3-1XXX
MB3730	2	U1,U2	0066-188XX-XX4X
2 PIN STRT. KK156	1	J2	3000-16367-0200
3 " " "	2	J1,J2	3000-16367-0300
4 " " "	1	J1	3000-16367-0400
HEATSINK ASSY.	2	HSA1, HSA2	0986-00804-1800
HEYCO BUSHING	4	MH1-MH4	0017-00042-0014
PC BOARD	1		A080-90910-D000

M051-00986-D010

PROJECT ENG. C. MEDNICK

THIS DWG. IS CONFIDENTIAL & PROPERTY OF MIDWAY MFG. CO.

DIM. TOLERANCES
UNLESS OTHERWISE SPEC.
CONCENTRICITY T.I.R. .002
FRACTIONAL ± 1/64
DECIMAL ± .005
HOLE DIA. + .002 — .000
ANGLE ± 1/2°
DO NOT SCALE DWG

FIRST USED ON: KICK
DRN: TJK
DATE: 12-14-81
SCALE: FULL
MECH CHK:
MAT'L:
ELEC CHK: C. M. H.
FINISH:

MIDWAY MFG. CO.
FRANKLIN PK., IL. 60131 A BALLY CO.

DUAL PWR. AMP. ASSY

A082-90910-D000

REVISIONS

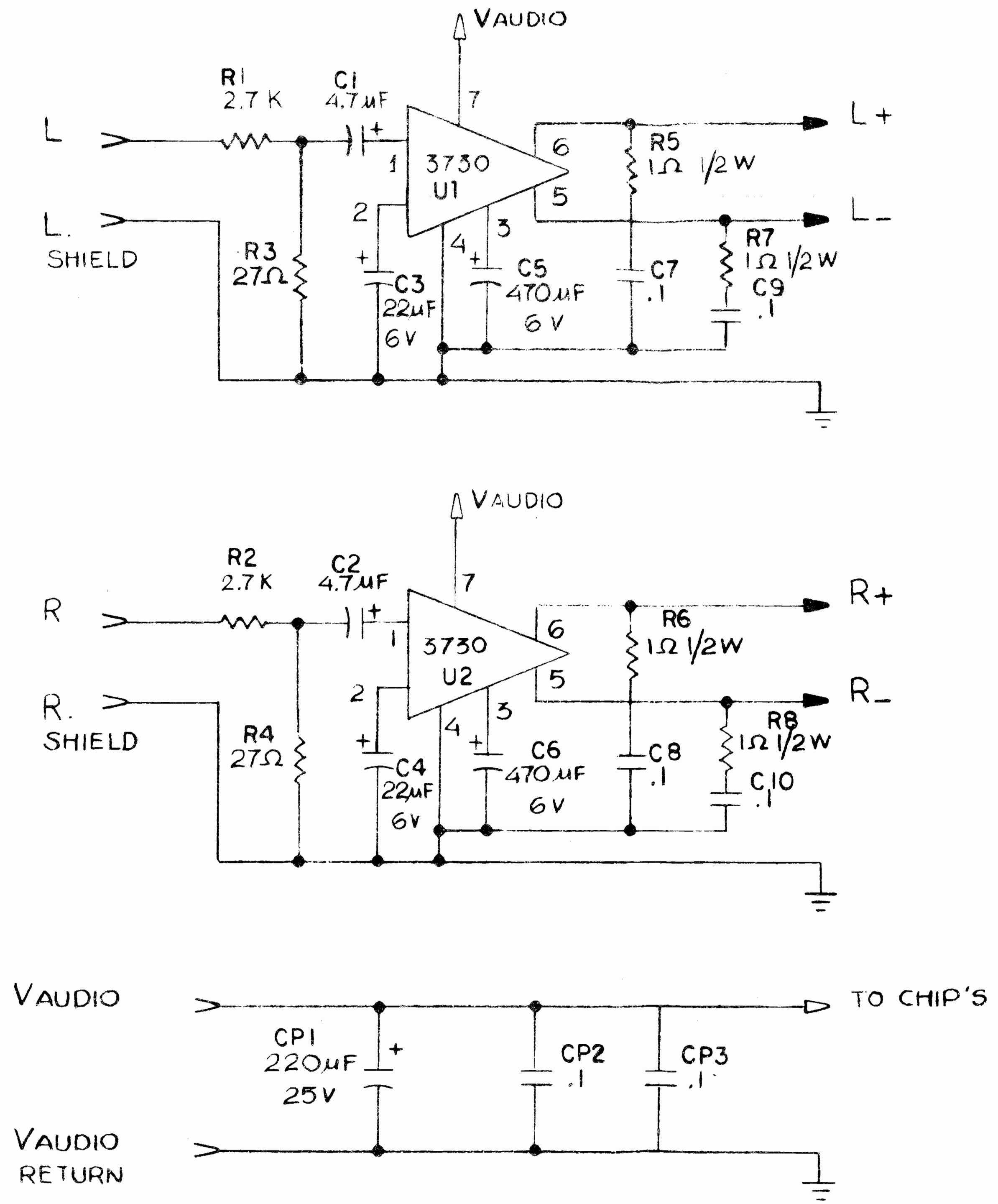
PART NO. M051-00986-D010

J1

PIN	SIGNAL
PIN 1	N.C.
" 2	L. AUDIO
" 3	L. SHIELD
" 4	KEY
" 5	V AUDIO RETURN
" 6	R. AUDIO
" 7	R. SHIELD
" 8	V AUDIO

J2

PIN	SIGNAL
PIN 1	R +
" 2	R −
" 3	KEY
" 4	L +
" 5	N.C
" 6	L −



PROJECT ENG. C. MEDNICK

THIS DWG. IS CONFIDENTIAL & PROPERTY OF MIDWAY MFG. CO.

DIM. TOLERANCES UNLESS OTHERWISE SPEC.	
CONCENTRICITY T.I.R.	.002
FRACTIONAL	± 1/64
DECIMAL	± .005
HOLE DIA.	+ .002 — .000
ANGLE	± 1/2°
DO NOT SCALE DWG	

FIRST USED ON: MCR II
DRN: T.V.T
DATE: 12-14-81
SCALE: FULL
MECH CHK:
MAT'L:
ELEC CHK: C. M. M.
FINISH:

MIDWAY MFG. CO.
FRANKLIN PK., IL. 60131 A BALLY CO.

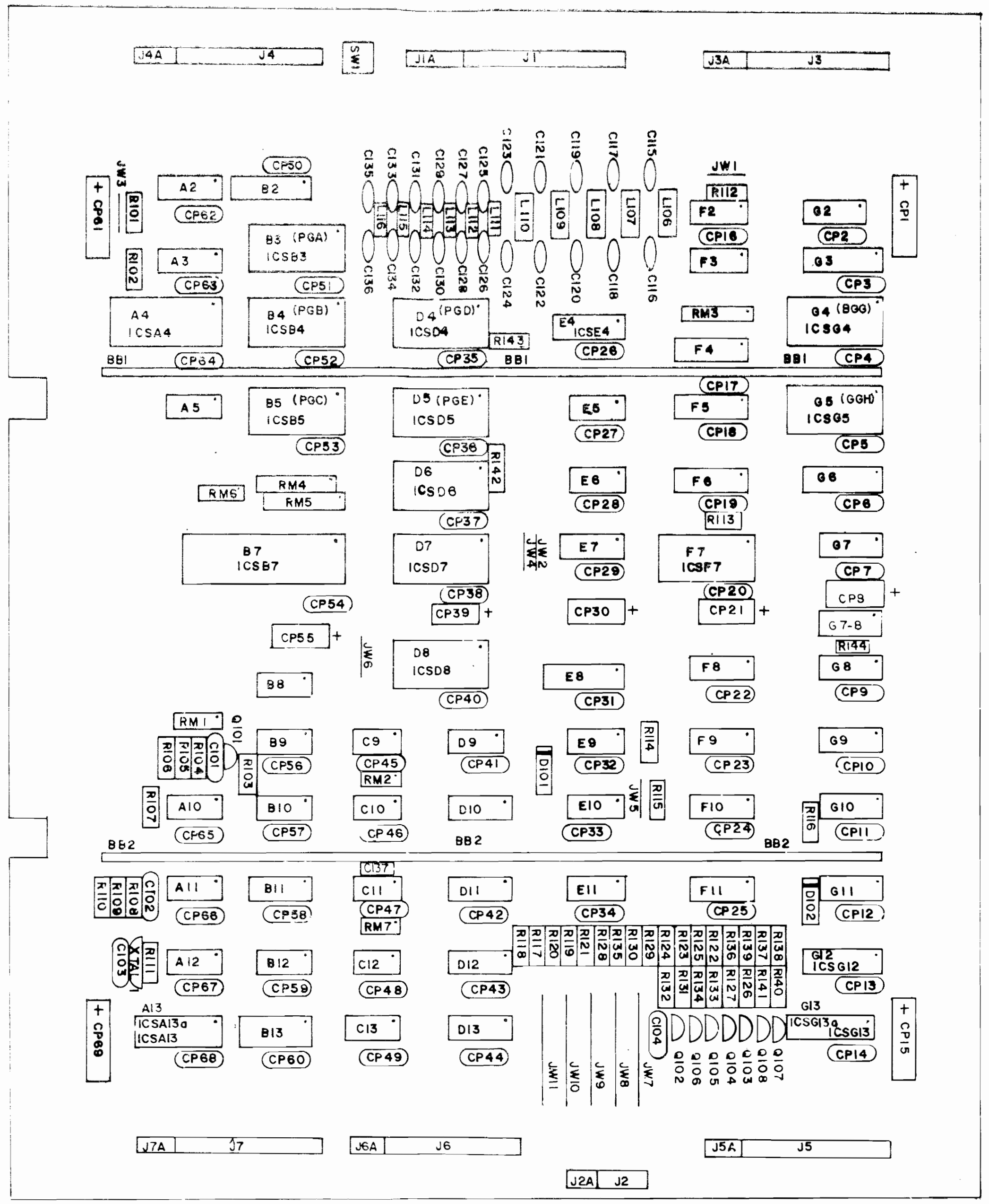
DUAL PWR AMP
A082-90910-D000

REVISIONS

PART NO. M051-00986-D011

DESIGNATION LIST

DESIGNATION	DESCRIPTION
C101	33 PF 50V AX.CER
C102	.1 MF " "
C103	.1 MF 100V MYLAR
C104	390 PF 50V AX. CER
C115-C137	.01 MF " "
CP1	470 MF 16V ELECT. AX.
CP2-CP7	.01 MF 50V AX. CER.
CP8	10 MF 25V AX. TANT.
CP9-CP14	.01 MF 50V AX. CER.
CP15	470 MF 16V ELECT. AX.
CP16-CP20	.01 MF 50V AX. CER.
CP21	10 MF " "
CP22-CP29	.01 MF " "
CP30	10 MF " "
CP31-CP38	.01 MF " "
CP39	10 MF " "
CP40-CP54	.01 MF " "
CP55	10 MF " "
CP56-CP60	.01 MF " "
CP61	470 MF 16V ELECT. AX.
CP62-CP68	.01 MF 50V AX. CER.
CP69	470 MF 16V ELECT. AX.
R101, R102	4.7 K OHM 1/4W CRBN.
R103	560 " " "
R104	1.2 K " " "
R105	220 " " "
R106	22 " " "
R107	4.7K " " "
R108	330 " " "
R109, R110	1K " " "
R111	330 " " "
R112	10K " " "
R113	1K " " "
R114, R115	4.7K " " "
R116	1K " " "
R117, R118	560 " " "
R119	100 " " "
R120	820 " " "
R121	130 " " "
R122	2K " " "
R123	1K " " "
R124	470 " " "
R125	240 " " "
R126, R127	10 " " "
R128	130 " " "
R129	2K " " "
R130	1K " " "
R131	470 " " "
R132	240 " " "
R133, R134	10 " " "
R135	130 " " "
R136	2K " " "
R137	1K " " "
R138	470 " " "
R139	240 " " "
R140, R141	10 " " "
R142, R143	4.7K " " "
R144	1K " " "
RM1	4.7 K OHM 6 PIN SIP
RM2	1K " " " "
RM3	4.7K " 9 " "
RM4, RM5	10 K " 10 " "
RM6	10 K " 6 " "
RM7	560 " " " "
D101	IN5817
D102	IN4148
Q101	2N4403
Q102	2N4123
Q103-Q108	MPSA70
IC A2	74161
" A3	74LS367
" A4	MK3882
" A5	74LS32
" A10, A11	74S74
" A12	74S04
" A13	H-T
" B2	74LS244
" B3	EPROM
" B4	EPROM
" B5	EPROM
" B7	MK3880
" B8	7474
" B9	7432
" B10	74S04
" B11	74LS367
" B12	7432
" B13	V&H—T
IC C9	74LS08
" C10	7474
" C11	74S04
" C12, C13	7420
" D4	EPROM
" D5	EPROM
" D6	EPROM
" D7	EPROM
" D8	8416-20
" D9	74LS155
" D10-D13	74LS157
" E4	NVR CONT
" E5, E6	7432
" E7	74LS138
" E8	74LS244
" E9	7420
" E10	74S04
" E11	7427
" F2	4053
" F3	4017
" F4, F5	74LS245
" F6	74LS374
" F7	4801-AN-4
" F8, F9	74LS157
" F10, F11	7489
" G2	74LS153
" G3	74LS374
" G4	EPROM
" G5	EPROM
" G6	74LS374
" G7	74LS153
" G8 - G11	7489
" G12	MISC-T
" G13	V-T
G7-8	74LS174
L106-L110	10μH W.W.
L111 - L116	10μH MOLD
ICSA4	28 PIN IC SOCKET
ICSA13	16 " " "
ICSA13a	8 " " "
ICSB3-ICSB5	24 " " "
ICSB7	40 " " "
ICSB13	20 " " "
ICSD4 - ICSD8	24 " " "
ICSF7	24 " " "
ICSG4, ICSG5	24 " " "
ICSG12	20 " " "
ICSG13	16 " " "
ICSG13a	8 " " "
ICSE4	20 " " "
BB1, BB2	BUS BAR
S.W.	SWITCH P.B. MTG
XTAL1	19 968 MHZ CRYSTAL
JW1 - JW11	JUMPER WIRE
J1A	KK-156 STR. 5 PIN
J1	" " " 14 PIN
J2A	KK-100 RT. ANGLE 2PIN
J2	" " " " 6 PIN
J3, J4, J5, J6, J7	" " " " 24 PIN
J3, J4, J5, J6, J7	FLEX-PAC JUMPER
A080-90009-H000	CPU. BD.




CROSS REFERENCE LIST

DESCRIPTION	QT'Y	DESIGNATION	PART NO.
33 PF 50V AX. CER.	1	C101	0986-00800-0300
390 PF " "	1	C104	0986-00800-3000
.01 MF " "	83	CP2-CP7, CP9-CP14, CP16-CP20, CP22-CP29, CP31-CP38, CP40-CP54, CP56-CP60, CP62-CP68, CP115-CP136, C137	0986-00800-2200
.1 MF 100V MYLAR	1	C103	0986-00800-0100
.1 MF 50V AX. CER.	1	C102	0986-00800-0200
10 MF 25V AX. TANT	5	CP8, CP21, CP30, CP39, CP55	0986-00800-3400
470 MF 16V ELECT.	4	CP1, CP15, CP61, CP69	0986-00800-3300
10 OHM 1/4W CRBN	6	R126, R127, R133, R134, R140, R141	0062-05183-1XXX
22 " " "	1	R106	0062-06383-1XXX
100 " " "	1	R119	0062-11083-1XXX
130 " " "	3	R121, R128, R135	0062-11983-1XXX
220 " " "	1	R105	0062-13383-1XXX
240 " " "	3	R125, R132, R139	0062-13583-1XXX
330 " " "	2	R108, R111	0062-14483-1XXX
470 " " "	3	R124, R131, R138	0062-15683-1XXX
560 " " "	3	R103, R117, R118	0062-16283-1XXX
820 " " "	1	R120	0062-17483-1XXX
1K " " "	8	R109, R113, R116, R123, R130, R137, R110, R144	0062-17983-1XXX
1.2K " " "	1	R104	0062-18383-1XXX
2K " " "	3	R122, R129, R136	0062-19383-1XXX
4.7K " " "	7	R101, R102, R107, R114, R115, R142, R143	0062-21183-1XXX
10K " " "	1	R112	0062-22783-1XXX
560 OHM 6 PIN SIP	1	RM7	0986-00804-2600
1K " " " "	1	RM2	0986-00804-2500
4.7K " 9 " "	1	RM3	0986-00804-2200
4.7K " 6 " "	1	RM1	0986-00804-2400
10 K " " " "	1	RM6	0986-00804-2300
10K " 10 " "	2	RM4, RM5	0986-00804-2700
IN4148	1	D102	0986-00801-0100
IN5817	1	D101	0988-00801-0300
MPSA70	6	Q103-Q108	0986-00802-0300
2N4123	1	Q102	0986-00802-0100
2N4403	1	Q101	0986-00802-0200
74S04	4	IC A12, B10, C11, E10	0986-00803-0400
74LS08	1	" C9	0986-00803-1600
7420	3	" C12, C13, E9	0986-00803-1200
7427	1	" E11	0986-00803-8800
7432	4	" B9, B12, E5, E6	0986-00803-0500
74LS32	1	" A5	0986-00803-0600
7474	2	" B8, C10	0986-00803-1400
74S74	2	" A10, A11	0986-00803-1500
7489	6	" F10, F11, G8, G9	0986-00803-1800
74LS138	1	" E7	0986-00803-1900
74LS153	2	" G2, G7	0986-00803-1000
74LS155	1	" D9	0986-00803-8600
74LS157	6	" D10-D13, F8, F9	0986-00803-1100
74161	1	" A2	0986-00803-0100
74LS174	1	" G7-8	0986-00803-9300
74LS244	2	" B2, E8	0988-00803-0800
74LS245	2	" F4, F5	0986-00803-0900
74LS367	2	" A3, B11	0986-00803-2200
74LS374	3	" F6, G3, G6	0986-00803-0700
MK3880	1	" B7	0986-00803-7800
MK3882	1	" A4	0986-00803-7700
4017	1	" F3	0986-00803-8700
4053	1	" F2	0988-00803-2000
4801-AN-4	1	" F7	0986-00803-8400
8416-20	1	" D8	0986-00803-8100
H-T	1	" A13	0986-00803-8900
V-T	1	" G13	0986-00803-9000
V&H-T	1	" B13	0986-00803-9100
MISC-T	1	" G12	0986-00803-9200
NVR CONT	1	" E4	0986-00803-3200
EPROM	1	" B3 (PGA)	OPTION KIT: UPRIGHTS 0982-00803-0100; OPTION KIT: COCKTAILS, MINIS 0580-00803-1700
EPROM	1	" B4 (PGB)	
EPROM	1	" B5 (PGC)	
EPROM	1	" D4 (PGD)	
EPROM	1	" D5 (PGE)	
EPROM	1	" D6 (PGF)	
EPROM	1	" D7	
EPROM	1	" G4 (BGG)	
EPROM	1	" G5 (BGH)	
10μH W.W	5	L106-L110	0986-00804-0200
10μH MOLD	6	L111-L116	0986-00804-3300
19.968 MHZ CRYSTAL	1	XTAL1	0986-00804-0100

DESCRIPTION	QT'Y	DESIGNATION	PART NO.
8 PIN SOCKET	2	ICSA13a, ICSG13a	0986-00804-3600
16 " "	2	ICSA13, ICSG13	0986-00804-3700
20 " "	3	ICSB13, ICSG12, ICSE4	0986-00804-3800
24 " "	11	ICSB3 - ICSB5, ICSD4 - ICSD8, ICSF7, ICSG4, ICSG5	0986-00804-3400
28 " "	1	ICSA4	0986-00804-3900
40 " "	1	ICSB7	0986-00804-3500
BUS BAR	2	BB1, BB2	0986-00804-4100
SWITCH P.B. MTG.	1	SW1	0986-00804-3100
JUMPER WIRE	11	JW1-JW11	0986-00804-3200
KK100 RT ANGLE 2PIN	1	J2 A	0986-00804-4200
" " 6PIN	1	J2	0986-00804-4300
KK156 STR. 5PIN	1	J1A	0986-00804-4400
" " 14 PIN	1	J1	
KK100 RT ANGLE 24 PIN	5	J3-J7	0986-00804-4700
FLEX-PAC JUMPER	5	J3-J7	0986-00804-4800
CPU BD.			A080-90009-H000

PROJECT ENG: J. BOYDSTON.

DO NOT SCALE DWG	HEAT TREAT	SCALE FULL	USED ON SOLAR FOX; NO. REQ'D 1 PER.	MIDWAY MFG. CO. FRANKLIN PK. ILL. (REVISIONS)
DIM. TOLERANCES UNLESS SPECIFIED: CONCENTRICITY T.I.R. .001; FRACTIONAL ±1/64; DECIMAL ±.005; HOLE DIA. +.002 .001	DRN M.M.; CKD J.B.; DATE 2/16/82	MAT'L; FINISH	ASSEMBLY DRAWING CPU A082-90009-H000	PART NO. M051-00982-A005



PROJECT ENG J. BOYDSTON

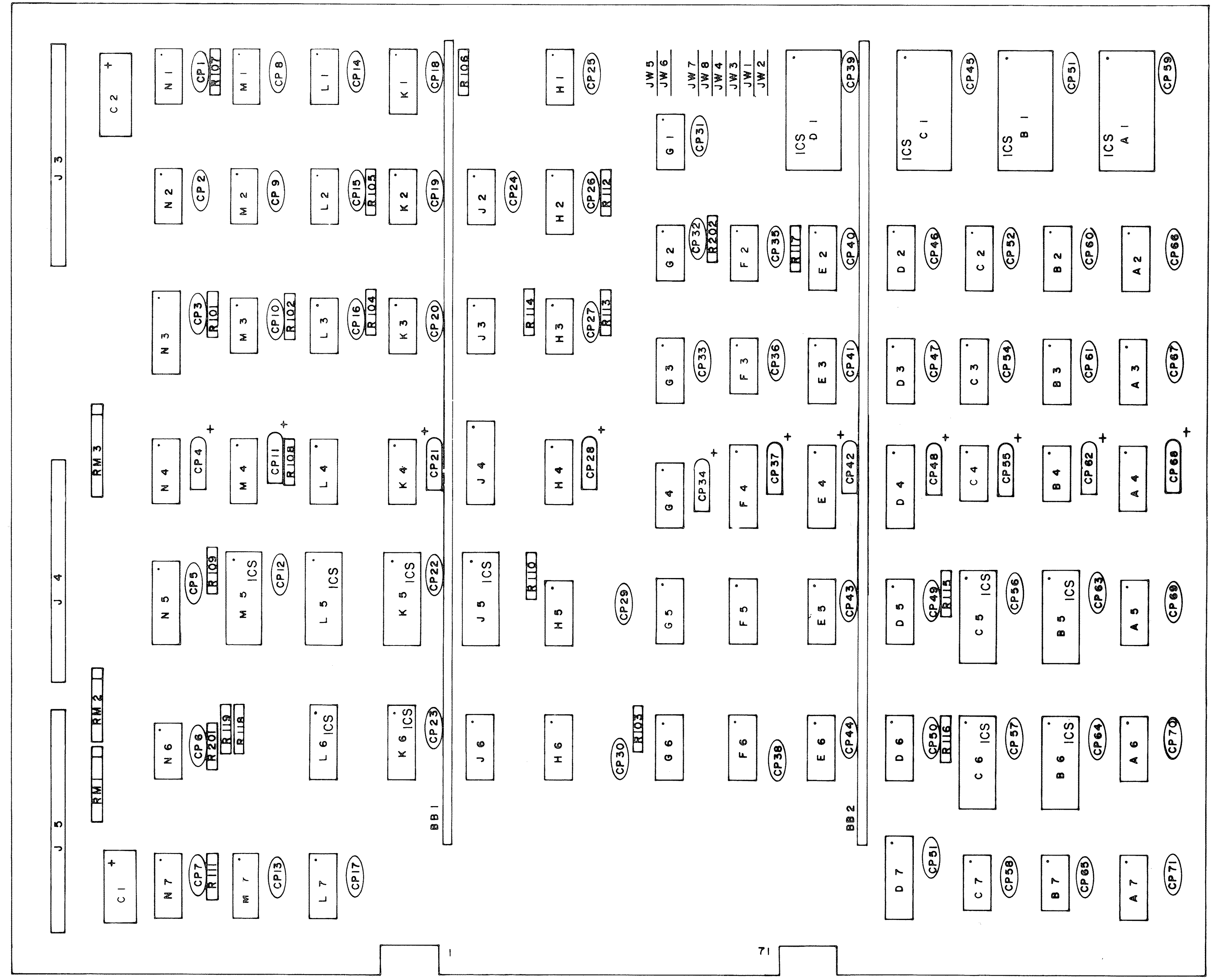
FULL	SOLARFOX	1 PER	MIDWAY MFG. CO.
02/16/82	CPU SCHEMATIC A082-90008-H000		M051-00982-A006

DESIGNATION LIST

DESIGNATION	DESCRIPTION
C1, 2	100 µf AX. ELECT
CP1-3, 5-10 CP12-20, 22-27, CP29-33, 35, 36, CP38-41, 43-47, CP49-54, 56-61, CP63-67, 69-71.	.01µf AX. CER.
CP4, 11, 21, 28, 34, CP37, 42, 48, 55, CP62, 68.	10µf 25V AX. TANT.
R101-119, 201, 202,	1 K 1/4W 5%
RM1, 2	8PIN 1 K SIP
RM 3	10PIN 1 K SIP

DESIGNATION	DESCRIPTION
IC A 1	EPROM
IC A 2	74 LS157
IC A 3	74 LS157
IC A 4	74 LS157
IC A 5	74 LS157
IC A 6	74 LS157
IC A 7	74 LS157
IC B 1	EPROM
IC B 2	74 LS194
IC B 3	74 LS194
IC B 4	74 LS32
IC B 5	422
IC B 6	422
IC B 7	74LS32
IC C 1	EPROM
IC C 2	74 LS194
IC C 3	74 LS194
IC C 4	74 LS 32
IC C 5	422
IC C 6	422
IC C 7	74 LS 32
IC D 1	EPROM
IC D 2	74 LS194
IC D 3	74 LS194
IC D 4	74 LS273
IC D 5	74 LS157
IC D 6	74 LS157
IC D 7	74 LS273
IC E 2	74 LS194
IC E 3	74 LS194
IC E 4	74 LS 374
IC E 5	74 LS157
IC E 6	74 LS157
IC F 2	7400
IC F 3	74 S 04
IC F 4	74 LS 374
IC F 5	74 LS 157
IC F 6	74 LS 157
IC G 1	74 LS 86
IC G 2	74 LS 20
IC G 3	74 LS 283
IC G 4	74 LS 283
IC G 5	74 LS 283
IC G 6	74 LS157

DESIGNATION	DESCRIPTION
IC H 1	74 LS 86
IC H 2	74174
IC H 3	74 S 74
IC H 4	74175
IC H 5	74174
IC H 6	74 LS 157
IC J 2	74 LS 30
IC J 3	7430
IC J 4	74 LS273
IC J 5	422
IC J 6	74 LS157
IC K 1	74161
IC K 2	7430
IC K 3	7474
IC K 4	74161
IC K 5	422
IC K 6	2114-2
IC L 1	74 LS 20
IC L 2	7408
IC L 3	7474
IC L 4	74 LS283
IC L 5	422
IC L 6	2114-2
IC L 7	74 LS 157
IC M 1	7430
IC M 2	7432
IC M 3	74 S 74
IC M 4	74161
IC M 5	422
IC M 7	74 LS 157
IC N 1	7430
IC N 2	7427
IC N 3	74 LS273
IC N 4	74 LS 283
IC N 5	74 LS 245
IC N 6	7404
IC N 7	74 LS 157
ICS A1, B1, C1, D1.	28PIN IC SOCKET
ICS B5, 6, C5, 6, J5, K5, L5, M5.	22PIN IC SOCKET
ICS K6, L6.	18PIN IC SOCKET
J3, 4, 5	24 PIN SOCKET
JW1-8	JUMPER WIRE
BB1, 2	BUSS BAR



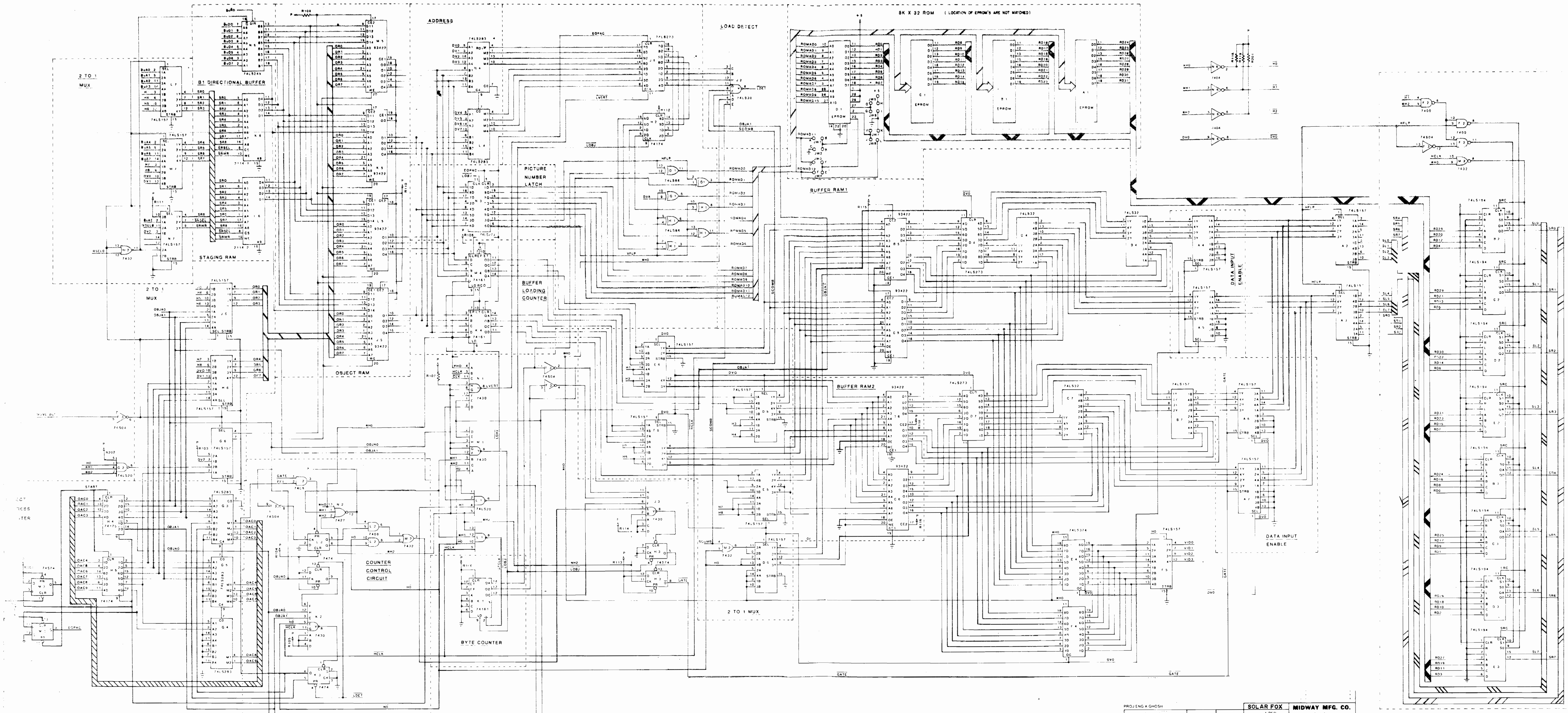
CROSS REFERENCE LIST

Q'TY	DESCRIPTION	DESIGNATION	PART NO.
60	.01 µf 50V AX. CER.	CP1-3, CP5-10, CP12-20, CP22-27, CP29-33, CP35, 36, CP38-41, CP43-47, CP49-54, CP56-61, CP63-67, CP69-71.	0986-00800-2500
11	10 µf 25 V AX. TANT.	CP4, 11, 21, 28, 34, 37, CP42, 48, 55, 62, 68.	0986-00800-2400
2	100 µf 25 V AX. ELECT.	C1, 2.	0986-00800-1800
21	1 K 1/4 W CRBN. FLM.	R101-119, 201, 202.	0062-179B3-1XXX
2	1 K 8 PIN SIP	RM1, 2.	0986-00804-1100
1	1 K 10 PIN SIP	RM 3	0986-00804-1000.
2	2114-2	K6, L6.	0986-00803-2300
1	7400	F2	0986-00803-2800
1	7404	N6	0986-00803-8300
1	74S04	F3	0986-00803-3100
1	7408	L2	0986-00803-3200
2	74LS20	G2, L1	0986-00803-3400
1	7427	N2	0986-00803-3500
4	7430	J3, K2, M1, N1	0986-00803-3600
1	74LS30	J2	0986-00803-4300
1	7432	M2	0986-00803-4400
4	74LS32	B4,7, C4,7,	0986-00803-3700
2	7474	K3, L3	0986-00803-4500
2	74S74	H3, M3	0986-00803-4100
2	74LS86	G1, H1	0986-00803-4200
18	74LS157	A2,3,4,5,6,7, D5,6, E5,6, F5,6, G6, H6, J6, L7, M7, N7.	0986-00803-2400
3	74161	K1, K4, M4.	0986-00803-2500
2	74174	H2, 5	0986-00803-2600
1	74175	H4	0986-00803-2700
8	74LS194	B2,3, C2,3, D2,3, E2,3.	0986-00803-2900
1	74LS245	N5	0986-00803-3000
4	74LS273	D4,7, J4, N3	0986-00803-3800
5	74LS283	G3,4,5, L4, N4,	0986-00803-3900
2	74LS374	E4, F4	0986-00803-4000
8	93422	B5,6, C5,6, J5, K5, L5, M5	0986-00804-0800
1	EPROM	A1 (VG A)	OPTION KIT: COCKTAILS, MINIS 0580-00803-0100
1	EPROM	B1 (VG B)	
1	EPROM	C1 (VG C)	OPT. KIT: UPRIGHTS 0982-00803-2000
1	EPROM	D1 (VG D)	
8	JUMPER WIRE	JW1-8	0986-00805-0200
2	BUSS BAR	BB1, 2	0986-00804-0900
1	P.C. BOARD		A080-91399-E000
3	24 PIN SOCKET	J3,4,5	0986-00804-4700
4	28 PIN SOCKET	ICS A1, B1, C1, D1	0986-00804-0300
8	22 PIN SOCKET	ICS B5,6, C5,6, J5, K5, L5, M5	0986-00804-0700
2	18 PIN SOCKET	ICS K6, L6	0986-00804-0600

PROJ. ENG. ATISH GHOSH

DO NOT SCALE DWG	HEAT TREAT	SCALE	USED ON SOLAR FOX / NO REQ'D 1 PER	MIDWAY MFG. CO. FRANKLIN PK ILL
DIM. TOLERANCES UNLESS SPECIFIED	DRN / CK A.G. / D 4/22/82	MAT'L / FINISH	ASS'Y DRAWING VIDEO GENERATOR P.C A082-91399-F000	PART NO M051-00982-A007

REVISIONS



PROJ ENG A GHOSH

SOLAR FOX	MIDWAY MFG. CO.
1 PER	
SCHEMATIC VIDEO GEN A082-91399-F000	M051-00982-A008

02/16/82

J 3 (24 PIN RIBBON CABLE)

1 – 3	GND
4 – 6	+ 5 V
7	SCOMB
8	CLK
9	HCLK
10	$\overline{\text{HCLK}}$
11	RSEL 0
12	+ 5 SENCE
13	START
14	MOVBUF
15	$\overline{654}$
16	DV 0
17	DV 1
18	DV 2
19	DV 3
20	DV 4
21	DV 5
22	DV 6
23	DV 7
24	DV 8

J 4 (24 PIN RIBBON CABLE)

1	GND
2	μRD
3	GND
4	μD 0
5	BμD 1
6	BμD 2
7	BμD 3
8	BμD 4
9	BμD 5
10	BμD 6
11	BμD 7
12	GND
13	BμA 0
14	BμA 1
15	BμA 2
16	BμA 3
17	BμA 4
18	BμA 5
19	BμA 6
20	BμA 7
21	BμA 8
22	GND
23	Φ H 0
24	Φ H 1

J 5 (24 PIN RIBBON CABLE)

1	Φ H 2
2	GND
3	H 0
4	H 1
5	H 2
6	H 3
7	H 4
8	H 5
9	H 6
10	H 7
11	H 8
12	GND
13	VID 0
14	VID 1
15	VID 2
16	VID 3
17	WSEL 0
18	GND
19 – 21	+ 5 V
22 – 24	GND

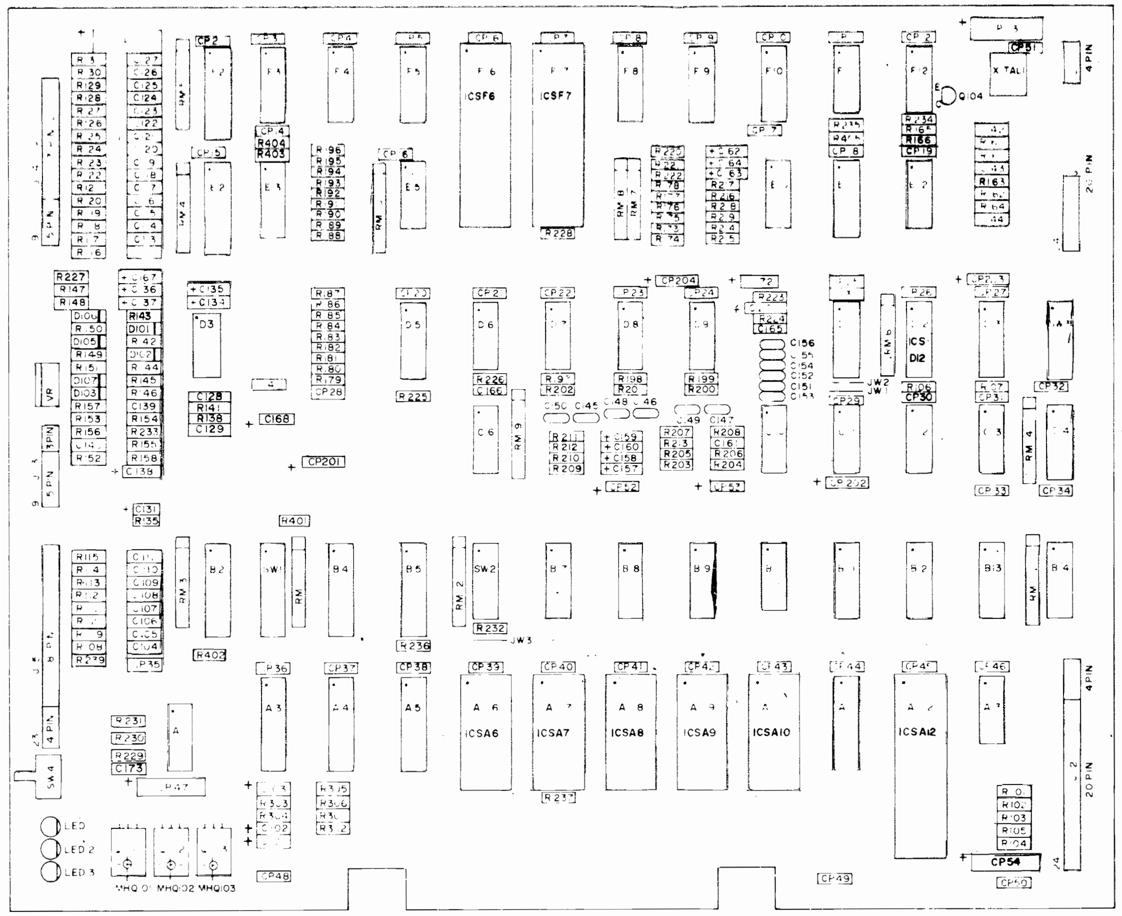
72 PIN TEST CONN. (EDGE)

1	GND		
2	+ 5 V	42	H 2
3	GND	43	H 3
4	+ 5 V	44	H 4
5 – 8	NOT USED	45	H 5
9	BμD 0	46	H 6
10	BμD 1	47	H 7
11	BμD 2	48	H 8
12	BμD 3	49, 50	NOT USED
13	BμD 4	51	$\overline{654}$
14	BμD 5	52	NOT USED
15	BμD 6	53	RSEL 0
16	BμD 7	54	WSEL 0
17	VID 0	55	START
18	VID 1	56	$\overline{\text{CLK}}$
19	VID 2	57	GND
20	VID 3	58	HCLK
21	MOVBUF	59	GND
22	SCOMB	60	$\overline{\text{HCLK}}$
23	BμA 8	61	GND
24	DV 0	62	H 0
25	BμA 0	63	GND
26	BμA 1	64	Φ H 0
27	BμA 2	65	GND
28	BμA 3	66	Φ H 1
29	BμA 4	67	GND
30	BμA 5	68	Φ H 2
31	BμA 6	69	GND
32	BμA 7	70	+ 5 V
33	DV 1	71	GND
34	DV 2	72	+ 5 V
35	DV 3		
36	DV 4		
37	DV 5		
38	DV 6		
39	DV 7		
40	DV 8		
41	H 1		

DESIGNATION LIST

DESIGNATION	DESCRIPTION
C101 C103	10 MF 25V AX TANT
C112 C127	.1 MF 50V AX CER
C128, C129	47 PF 50V AX CER
C130	220 PF " " "
C131	10 MF 25V AX TANT
C134, C137	1 MF 20V AX TANT
C138	10 MF 25V AX TANT
C139	.047 MF 100V MYLAR
C140, C141	.01 MF 50V AX CER
C142	100 PF 50V AX CER
C143	.1 MF 50V AX CER
C144	33 PF 50V AX CER
C145 C156	.0022 MF 100V 10% MYLAR
C157 C159	1 MF 20V AX TANT
C161	330 PF 50V AX CER
C162 C164	1 MF 20V AX TANT
C165	330 PF 50V AX CER
C166 C168, C172	10 MF 25V AX TANT
C173	.01 MF 50V AX CER.
CP1	470 MF 16V AX ELECT
CP2 CP12	.01 MF 50V AX CER
CP13	470 MF 16V AX ELECT
CP14 CP33	.01 MF 50V AX CER
CP34	10 MF 25V AX TANT
CP35 CP46	.01 MF 50V AX CER
CP47	470 MF 16V AX ELECT
CP48 CP51	.01 MF 50V AX CER
CP52 CP53	10 MF 25V AX TANT
CP54	470 MF 16V AX ELECT
CP201 CP204	10 MF 25V AX TANT
R101 R107	4.7 K 1/4W 5% CARBON
R116 R131	220 OHM " " "
R135	3.3 K " " "
R138, R141	180 K " " "
R142	100 K " " "
R144, R145	510 K " " "
R146	10 K " " "
R148	100 K " " "
R149 R150	510K " " "
R151	10 K " " "
R152	1 MEG " " "
R153	1 K " " "
R154	1 MEG " " "
R155, R156	10 K " " "
R157, R158	1.2 K " " "
R160 R161	330 OHM " " "
R162	220 OHM " " "
R163	1.2 K " " "
R164	22 OHM " " "
R165 R166	4.7 K " " "
R173 R178	5.6 K " " "
R179, R196	24K " " "
R197-R202	5.6K " " "
R203-R208	33K " " "
R209-R211	13 K " " "
R213	27K " " "
R214-R219	33K " " "
R220-R222	13K " " "
R224	27K " " "
R225, R226	4.7K " " "
R227	1K " " "
R228	4.7 " " "
R231	300 OHM " " "
R232	4.7K " " "
R233	3K " " "
R234, R235	4.7K " " "
R239	100 OHM " " "
R301-R306	2.7K " " "
R401	1K " " "
R402, R405	4.7K " " "
RM1	4.7K 10 PIN SIP
RM4, RM5	2.7K " " "
RM7	4.7K 8 " "
RM8	820 OHM " " "
RM9	1.8K 10 " "
RM14	4.7K " " "

DESIGNATION	DESCRIPTION
D101 D103, D105 107	1N4148
Q101 Q103	TIP 110
Q104	2N4403
IC 1A	7406
" 4A	74LS273
" 5A	74LS374
" 6A	1KX8 RAM
" 7A	ROM/EPROM 0
" 8A	" " 1
" 9A	" " 2
" 10A	" " 3
11A	74LS245
" 12A	Z 80 CPU
" 13A	74LS08
" 4B	74LS244
" 7B	74LS138
" 8B	"
" 9B	74LS670
" 10B	74LS32
" 11B	74LS670
" 12B	74LS138
" 13B	"
" 14B	74LS174
" 6C	7407
" 10C	MC3403
" 11C	74LS04
" 12C	MC14024
" 13C	7427
" 14C	74LS367
" 3D	LM3900
" 6D	74LS02
" 7D	MC14016
" 8D	"
" 9D	"
" 11D	74160
" 12D	PROM SB2 A
" 13D	74166
" 2E	74LS244
" 10E	MC3403
" 11E	74161
" 12E	74126
" 2F	74LS244
" 3F	74LS191
" 4F	"
" 5F	"
" 6F	AY 3 8910
" 7F	"
" 8F	74LS191
" 9F	"
" 10F	"
" 11F	7474
" 12F	74S04
ICS 6A-ICS 10A	24 PIN IC SOCKET
" 12A	40 PIN "
" 12D	16 PIN "
" 6F 7F	40 PIN "
J1, J2	20 PIN CONN KK 100 (SIP)
	4 PIN " "
J3	5 PIN KK 100 RT ANGLE
	3 PIN " "
J4	13 PIN " "
	5 PIN " "
J5	18 PIN " "
	4 PIN " "
JW1, JW2	JUMPER WIRE
LED 3	YELLOW LED
SW1	10 POSITION DIP
SW3	8 " "
SW4	PUSH BUTTON SW
XTAL 1	16 MHZ CRYSTAL
MHQ101 MHQ103	SNAP



W/O PANNING KIT

DESIGNATION LIST

DESIGNATION	DESCRITION
R403, R404	33K OHM 1/4w CRBN

CROSS REFERENCE LIST

DESCRITION	Q'TY	DESIGNATION	PART NO.
33 K OHM 1/4w CRBN	2	R403 R404	0062-251B3-1XXX

CROSS REFERENCE LIST

DESCRIPTION	QUANTITY	DESIGNATION	PART NO
33 PF 50V 5% AX CER	1	C144	0986-00800-0900
47 PF 50V AX CER	2	C128, C129	0986-00800-2800
220 PF 50V AX CER	1	C130	0986-00800-2900
100 PF 50V 5% AX CER	1	C142	0986-00800-1000
330 PF 50V AX CER	2	C161, C165	0986-00800-1300
.0022 MF 100V 10% MYLAR	12	C145-C156	0986-00800-1200
.047 MF 100V MYLAR	1	C139	0986-00800-2600
.01 MF 50V AX CER	49	CP2-CP12, CP14-CP33, CP35-CP46, CP48-CP51, C140, C141, C173	0986-00800-2000
.1 MF 50V AX CER	17	C112-127, C143	0986-00800-1100
1 MF 20V AX TANT	8	C157-159, C162-C164, C134, C137	0986-00800-1400
10 MF 25V AX TANT	16	CP34, CP52; CP53, CP201-CP204, C101-C103, C131, C138, C172, C166-C168, C172	0986-00800-0700
470 MF 16V AX ELECT	4	CP1, CP13, CP47, CP54	0986-00800-2700
22 OHM 1/4W	1	R164	0062-083B3-1XXX
100 OHM "	1	R239	0062-110B3-1XXX
220 OHM 1/4W	17	R116-131, R162	0062-133B3-1XXX
300 OHM "	1	R231	0062-141B3-1XXX
330 OHM "	2	R160-R161	0062-144B3-1XXX
1 K "	3	R153, R227, R401	0062-179B3-1XXX
1.2 K "	3	R157, R158, R163	0062-183B3-1XXX
2.7 K "	6	R301-R306	0062-199B3-1XXX
3 K "	1	R233	0062-201B3-1XXX
4.7 K "	17	R101-R107, R165-166, R225-226, R228, R232, R234, R235, R402, R405	0062-211B3-1XXX
5.6 K "	12	R173-R178, R197-R202	0062-215B3-1XXX
10 K "	4	R155, R156, R146, R151	0062-227B3-1XXX
13 K "	6	R209-R211, R220-R222	0062-233B3-1XXX
24 K "	2	R179, R196	0062-245B3-1XXX
27 K "	2	R213, R224	0062-247B3-1XXX
33 K "	13	R135, R203-R208, R214-R219	0062-251B3-1XXX
100K "	2	R142, R148	0062-275B3-1XXX
180 K "	2	R138, R141	0062-287B3-1XXX
510K "	4	R144, R145, R149, R150	0062-313B3-1XXX
1 MEG. "	2	R152, R154	0062-323B3-1XXX
820 OHM 8 PIN SIP	1	RM8	0986-00805-0800
1.8 K 10 PIN SIP	1	RM9	0986-00805-0600
2.7 K 10 PIN SIP	2	RM4, RM5	0986-00805-0500
4.7 K 8 PIN SIP	1	RM7	0986-00805-0400
4.7 K 10 PIN SIP	2	RM1, RM14	0986-00805-0300
1N4148	6	D101-D103, D105-D107	0986-00801-0200
2N4403	1	Q104	0986-00802-0500
TIP 110	3	Q101-Q103	0986-00802-0400
74LS02	1	D6	0986-00803-7400
74LS04	1	C11	0986-00803-6900
74S04	1	F12	0986-00803-6600
7406	1	A1	0986-00803-7600
7407	1	C6	0986-00803-5900
74LS08	1	A13	0986-00803-7300
7427	1	C13	0986-00803-7200
74LS32	1	B10	0986-00803-6100
7474	1	F11	0986-00803-6700
74126	1	E12	0986-00803-6800
74LS138	4	B12-B13, B7-B8	0986-00803-6500
74160	1	D11	0986-00803-5200
74161	1	E11	0986-00808-5100
74166	1	D13	0986-00803-5300
74LS174	1	B14	0986-00803-7500
74LS191	6	F3-F5, F8-F10	0986-00803-5600
74LS244	3	B4, E2, F2	0986-00803-4800
74LS245	1	A11	0986-00803-6400
74LS273	1	A4	0986-00803-4700
74LS367	1	C14	0986-00803-7000
74LS374	1	A5	0986-00803-4600
74LS670	2	B9, B11	0986-00803-6300
AY-3-8910	2	F6-F7	0986-00803-8500
LM3900	1	D3	0986-00803-4900
MC3403	2	C10, E10	0986-00803-5000
MC14016	3	D7-D9	0986-00803-6200
MC14024	1	C12	0986-00803-7100
PROM SB2-A	1	D12	0986-00803-8200
RAM 1K X 8 SUB.	1	A6	0986-00803-8000
ROM/EPROM 0	1	A7	
" 1	1	A8	
" 2	1	A9	
" 3	1	A10	
Z-80 (3880)	1	A12	0986-00803-5500
16 PIN IC SOCKET	1	ICSD12	0986-00804-1400
24 PIN " "	5	ICSA6-ICSA10	0986-00804-1600
40 PIN " "	3	ICSA12, ICSF6, ICSF7	0986-00804-1500
3 PIN KK-100 RT ANGEL	1	J3	3000-16366-0300
4 PIN " "	1	J5	3000-16366-0400
5 PIN " "	2	J3, J4	3000-16366-0500
13 PIN " "	1	J4	3000-16366-1300
18 PIN " "	1	J5	3000-16366-1800
4 PIN CONN.KK-100 (SIP)	2	J1, J2	0986-00804-1300
20 PIN " "	2	J1, J2	0986-00804-1200
JUMPER WIRE	2	JW1, JW2	0986-00804-4000
YELLOW LED	1	LED 3	0986-00804-2000
SNAP's	3	MHQ101 - MHQ103	0017-00007-0134
8 POSITION DIP SW.	1	SW3	0986-00805-0900
10 POSITION DIP SW.	1	SW1	0986-00805-1000
P.B. SW.	1	SW4	0986-00804-1700
16 MHZ CRYSTAL W/3RD LEAD	1	XTAL	0986-00805-1100

PROJECT ENG: CARY MEDNICK

DO NOT SCALE DWG

M.M 02/17/82

SOLOR FOX

1 PER

ASS'Y DRAWING SOUND I/O

A082-90908-G000

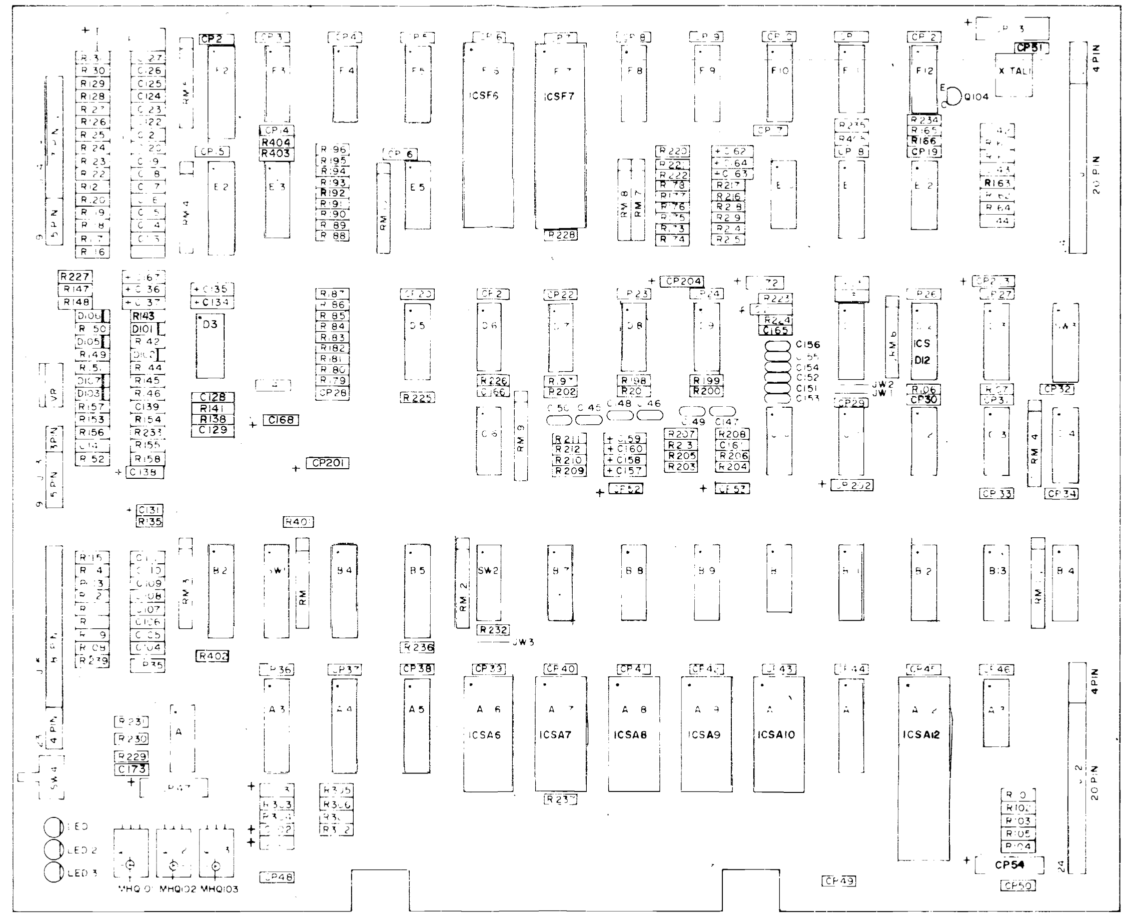
MIDWAY MFG. CO.

M051 00982 A009

DESIGNATION LIST

DESIGNATION	DESCRIPTION
C101-C103	10 MF 25V AX TANT
C112-C127	1 MF 50V AX CER
C128-C129	47 PF 50V AX CER
C130	220 PF " " "
C131	10 MF 25V AX TANT
C134, C137	1 MF 20V AX TANT
C138	10 MF 25V AX TANT
C139	.047 MF 100V MYLAR
C140 C141	.01 MF 50V AX CER
C142	100 PF 50V AX CER
C143	1 MF 50V AX CER
C144	33 PF 50V AX CER
C145-C156	.0022 MF 100V 10% MYLAR
C157-C159	1 MF 20V AX TANT
C161	330 PF 50V AX CER
C162-C164	1 MF 20V AX TANT
C165	330 PF 50V AX CER
C166-C168, C172	10 MF 25V AX TANT
C173	.01 MF 50V AX CER.
CP1	470 MF 16V AX ELECT
CP2-CP12	.01 MF 50V AX CER
CP13	470 MF 16V AX ELECT
CP14-CP33	.01 MF 50V AX CER
CP34	10 MF 25V AX TANT
CP35-CP46	.01 MF 50V AX CER
CP47	470 MF 16V AX ELECT
CP48-CP51	.01 MF 50V AX CER
CP52 CP53	10 MF 25V AX TANT
CP54	470 MF 16V AX ELECT
CP201-CP204	10 MF 25V AX TANT
R101-R107	4.7 K 1/4W 5% CARBON
R116-R131	220 OHM " "
R135	3.3 K " " "
R138 R141	180 K " " "
R142	100 K " " "
R144 R145	510 K " " "
R146	10 K " " "
R148	100 K " " "
R149 R150	510K " " "
R151	10 K " " "
R152	1 MEG " " "
R153	1 K " " "
R154	1 MEG " " "
R155 R156	10 K " " "
R157 R158	1.2 K " " "
R160 R161	330 OHM " " "
R162	220 OHM " " "
R163	1.2 K " " "
R164	22 OHM " " "
R165 R166	4.7 K " " "
R173 R178	5.6 K " " "
R179, R196	24K " " "
R197-R202	5.6K " " "
R203-R208	33K " " "
R209-R211	13 K " " "
R213	27K " " "
R214-R219	33K " " "
R220-R222	13K " " "
R224	27K " " "
R225, R226	4.7K " " "
R227	1K " " "
R228	4.7 " " "
R231	300 OHM " " "
R232	4.7K " " "
R233	3K " " "
R234, R235	4.7K " " "
R239	100 OHM " " "
R301-R306	2.7K " " "
R401	1K " " "
R402, R405	4.7K " " "
RM1	4.7K 10 PIN SIP
RM4, RM5	2.7K " " "
RM7	4.7K 8 " "
RM8	820 OHM " " "
RM9	1.8K 10 " "
RM14	4.7K " " "

DESIGNATION	DESCRIPTION
D101 D103, D105 107	1N4148
Q101 Q103	TIP 110
Q104	2N4403
IC 1A	7406
" 4A	74LS273
" 5A	74LS374
" 6A	1KX8 RAM
" 7A	ROM/EPROM 0
" 8A	" " 1
" 9A	" " 2
" 10A	" " 3
" 11A	74LS245
" 12A	Z 80 CPU
" 13A	74LS08
" 4B	74LS244
" 7B	74LS138
" 8B	"
" 9B	74LS670
" 10B	74LS32
" 11B	74LS670
" 12B	74LS138
" 13B	"
" 14B	74LS174
" 6C	7407
" 10C	MC3403
" 11C	74LS04
" 12C	MC14024
" 13C	7427
" 14C	74LS367
" 3D	LM3900
" 6D	74LS02
" 7D	MC14016
" 8D	"
" 9D	"
" 11D	74160
" 12D	PROM SB2 A
" 13D	74166
" 2E	74LS244
" 10E	MC3403
" 11E	74161
" 12E	74126
" 2F	74LS244
" 3F	74LS191
" 4F	"
" 5F	"
" 6F	AY 3 8910
" 7F	"
" 8F	74LS191
" 9F	"
" 10F	"
" 11F	7474
" 12F	74S04
ICS 6A-ICS 10A	24 PIN IC SOCKET
" 12A	40 PIN "
" 12D	16 PIN "
" 6F 7F	40 PIN "
J1, J2	20 PIN CONN KK 100 (SIP)
	4 PIN " "
J3	5 PIN KK 100 RT ANGLE
	3 PIN " "
J4	13 PIN " "
	5 PIN " "
J5	18 PIN " "
	4 PIN " "
JW1, JW2	JUMPER WIRE
LED 3	YELLOW LED
SW1	10 POSITION DIP
SW3	8 " "
SW4	PUSH BUTTON SW
XTAL 1	16 MHZ CRYSTAL
MHQ101 MHQ103	SNAP



W/O PANNING KIT

DESIGNATION LIST

DESIGNATION	DESCRITION
R403, R404	33K OHM 1/4w CRBN

CROSS REFERENCE LIST

DESCRITION	Q'TY	DESIGNATION	PART NO.
33 K OHM 1/4w CRBN	2	R403 R404	0062-251B3-IXXX

CROSS REFERENCE LIST

DESCRIPTION	QUANTITY	DESIGNATION	PART NO.
33 PF 50V 5% AX CER	1	C144	0986-00800-0900
47 PF 50V AX CER	2	C128, C129	0986-00800-2800
220 PF 50V AX CER	1	C130	0986 00800-2900
100 PF 50V 5% AX CER	1	C142	0986-00800-1000
330 PF 50V AX CER	2	C161, C165	0986-00800-1300
.0022 MF 100V 10% MYLAR	12	C145-C156	0986-00800-1200
.047 MF 100V MYLAR	1	C139	0986-00800-2600
.01 MF 50V AX CER	49	CP2-CP12, CP14-CP33, CP35-CP46, CP48-CP51, C140, C141, C173	0986-00800-2000
.1 MF 50V AX CER	17	C112-127, C143	0986-00800-1100
1 MF 20V AX TANT	8	C157-159, C162-C164, C134, C137	0986-00800-1400
10 MF 25V AX TANT	16	CP34, CP52, CP53, CP201-CP204, C101-C103, C131, C138, C172, C166-C168, C172	0986-00800-0700
470 MF 16V AX ELECT	4	CP1, CP13, CP47, CP54	0986-00800-2700
22 OHM 1/4W	1	R164	0062-063B3-1XXX
100 OHM "	1	R239	0062-110B3-1XXX
220 OHM 1/4W	17	R116-131, R162	0062-133B3-1XXX
300 OHM "	1	R231	0062-141B3-1XXX
330 OHM "	2	R160-R161	0062-144B3-1XXX
1 K "	3	R153, R227, R401	0062-179B3-1XXX
1.2 K "	3	R157, R158, R163	0062-183B3-1XXX
2.7 K "	6	R301-R306	0062-199B3-1XXX
3 K "	1	R233	0062-201B3-1XXX
4.7 K "	17	R101-R107, R165-166, R225-226, R228, R232, R234, R235, R402, R405	0062-211B3-1XXX
5.6 K "	12	R173-R178, R197-R202	0062-215B3-1XXX
10 K "	4	R155, R156, R146, R151	0062-227B3-1XXX
13 K "	6	R209-R211, R220-R222	0062-233B3-1XXX
24 K "	2	R179, R196	0062-245B3-1XXX
27 K "	2	R213, R224	0062-247B3-1XXX
33 K "	13	R135, R203-R208, R214-R219	0062-251B3-1XXX
100K "	2	R142, R148	0062-275B3-1XXX
180 K "	2	R138, R141	0062-287B3-1XXX
510K "	4	R144, R145, R149, R150	0062-313B3-1XXX
1 MEG. "	2	R152, R154	0062-323B3-1XXX
820 OHM 8 PIN SIP	1	RM8	0986-00805-0800
1.8 K 10 PIN SIP	1	RM9	0986-00805-0600
2.7 K 10 PIN SIP	2	RM4, RM5	0986-00805-0500
4.7 K 8 PIN SIP	1	RM7	0986-00805-0400
4.7 K 10 PIN SIP	2	RM1, RM14	0986-00805-0300
1N4148	6	D101-D103, D105-D107	0986-00801-0200
2N4403	1	Q104	0986-00602-0500
TIP 110	3	Q101-Q103	0986-00802-0400
74LS02	1	D6	0986-00803-7400
74LS04	1	C11	0986-00803-6900
74S04	1	F12	0986-00803-6600
7406	1	A1	0986-00803-7600
7407	1	C6	0986-00803-5900
74LS08	1	A13	0986-00803-7300
7427	1	C13	0986-00803-7200
74LS32	1	B10	0986-00803-6100
7474	1	F11	0986-00803-6700
74126	1	E12	0986-00803-6800
74LS138	4	B12-B13, B7-B8	0986-00803-6500
74160	1	D11	0986-00803-5200
74161	1	E11	0986-00808-5100
74166	1	D13	0986-00803-5300
74LS174	1	B14	0986-00803-7500
74LS191	6	F3-F5, F8-F10	0986-00803-5600
74LS244	3	B4, E2, F2	0986-00803-4800
74LS245	1	A11	0986-00803-6400
74LS273	1	A4	0986-00803-4700
74LS367	1	C14	0986-00803-7000
74LS374	1	A5	0986-00803-4600
74LS670	2	B9, B11	0986-00803-6300
AY-3-8910	2	F6-F7	0986-00803-8500
LM3900	1	D3	0986-00803-4900
MC3403	2	C10, E10	0986-00803-5000
MC14016	3	D7-D9	0986-00803-6200
MC14024	1	C12	0986-00803-7100
PROM SB2-A	1	D12	0986-00803-8200
RAM 1KX8 SUB.	1	A6	0986-00803-8000
ROM/EPROM 0	1	A7	
" 1	1	A8	
" 2	1	A9	
" 3	1	A10	
Z-80 (3880)	1	A12	0986-00803-5500
16 PIN IC SOCKET	1	ICSD12	0986-00804-1400
24 PIN " "	5	ICSA6-ICSA10	0986-00804-1600
40 PIN " "	3	ICSA12, ICSF6, ICSF7	0986-00804-1500
3 PIN KK-100 RT ANGEL	1	J3	3000-16366-0300
4 PIN " "	1	J5	3000-16366-0400
5 PIN " "	2	J3, J4	3000-16366-0500
13 PIN " "	1	J4	3000-16366-1300
18 PIN " "	1	J5	3000-16366-1800
4 PIN CONN.KK-100 (SIP)	2	J1, J2	0986-00804-1300
20 PIN " "	2	J1, J2	0986-00804-1200
JUMPER WIRE	2	JW1, JW2	0986-00804-4000
YELLOW LED	1	LED 3	0986-00804-2000
SNAP's	3	MHQ101-MHQ103	0017-00007-0134
8 POSITION DIP SW.	1	SW3	0986-00805-0900
10 POSITION DIP SW.	1	SW1	0986-00805-1000
P.B. SW.	1	SW4	0986-00804-1700
16 MHZ CRYSTAL W/3RD LEAD	1	XTAL	0988-00805-1100

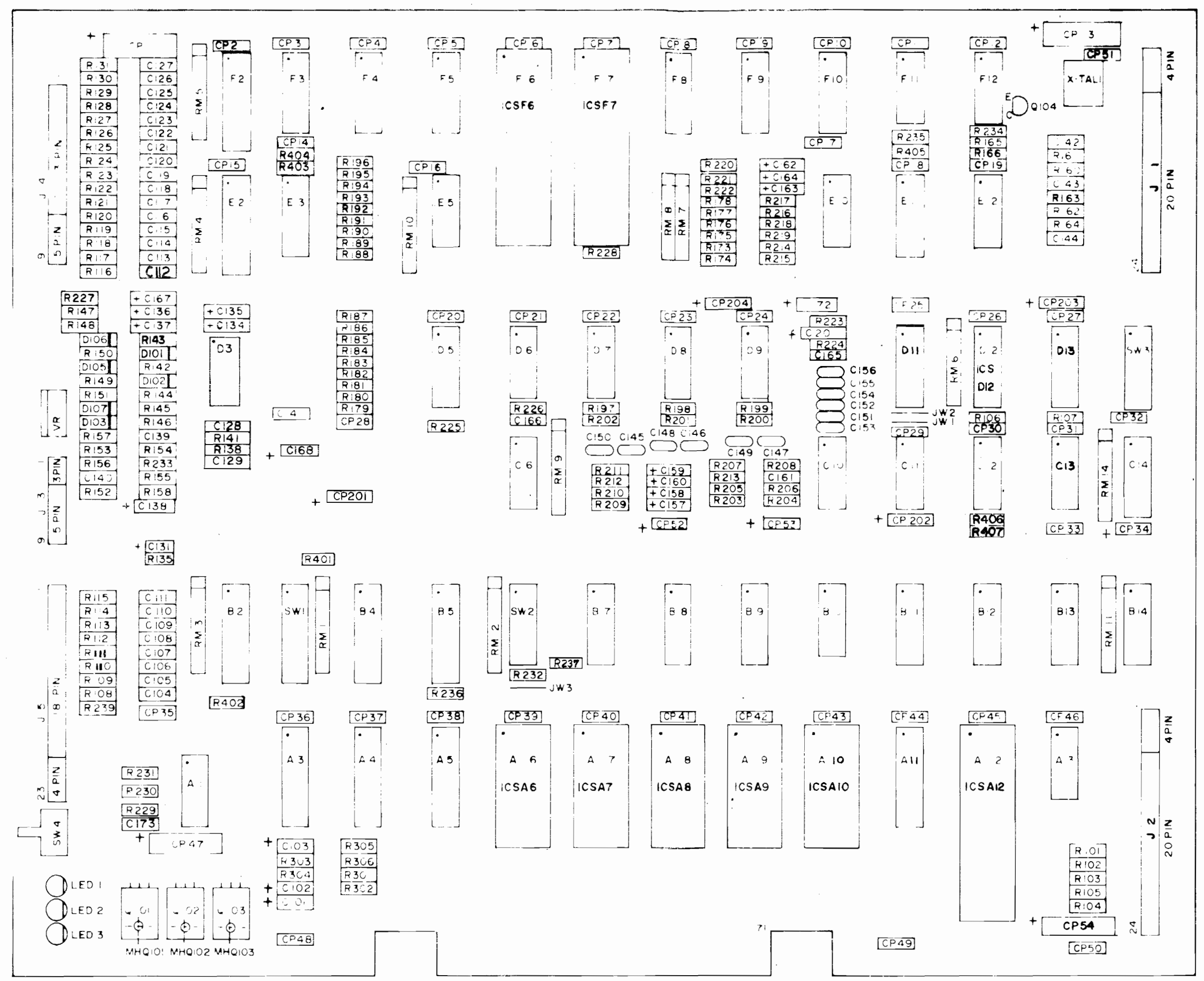
PROJECT ENG: CARY MEDNICK

M.M	02/17/82
SOLOR FOX	MIDWAY MFG. CO.
1 PER	
ASS'Y DRAWING SOUND I/O A082-90908-G000	M051 00982 A009

DESIGNATION LIST

DESIGNATION	DESCRIPTION
C101-C103	10 MF 25V AX TANT
C112-C127	.1 MF 50V AX CER
C128, C129	47 PF 50V AX CER
C131	10 MF 25V AX TANT
C134, C137	1 MF 20V AX TANT
C138	10 MF 25V AX TANT
C139	.047 MF 100V MYLAR
C140, C141	.01 MF 50V AX CER
C142	100 PF 50V AX CER
C143	.1 MF 50V AX CER
C144	33 PF 50V AX CER
C145-C156	.0022 MF 100V 10% MYLAR
C157-C159	1 MF 20V AX TANT
C161	330 PF 50V AX CER
C162-C164	1 MF 20V AX TANT
C165	330 PF 50V AX CER
C166-C168, C172	10 MF 25V AX TANT
C173	.01 MF 50V AX CER.
CP1	470 MF 16V AX ELECT
CP2-CP12	.01 MF 50V AX CER
CP13	470 MF 16V AX ELECT
CP14-CP33	.01 MF 50V AX CER
CP34	10 MF 25V AX TANT
CP35-CP46	.01 MF 50V AX CER
CP47	470 MF 16V AX ELECT
CP48-CP51	.01 MF 50V AX CER
CP52, CP53	10 MF 25V AX TANT
CP54	470 MF 16V AX ELECT
CP201-CP204	10 MF 25V AX TANT
R101-R107	4.7 K 1/4W 5% CARBON
R116-R131	220 OHM " " "
R135	3.3 K " " "
R138, R141	180 K " " "
R142	100 K " " "
R144, R145	620K " " "
R146	10 K " " "
R148	100 K " " "
R149, R150	620K " " "
R151	10 K " " "
R152	1 MEG " " "
R153	1 K " " "
R154	1 MEG " " "
R155, R156	10 K " " "
R157, R158	1.2 K " " "
R160, R161	330 OHM " " "
R162	220 OHM " " "
R163	1.2 K " " "
R164	22 OHM " " "
R165, R166	4.7 K " " "
R173-R178	5.6 K " " "
R179, R196	24K " " "
R197-R202	5.6K " " "
R203-R208	33K " " "
R209-R211	13 K " " "
R213	27K " " "
R214-R219	33K " " "
R220-R222	13K " " "
R224	27K " " "
R225, R226	4.7K " " "
R227	1K " " "
R228	4.7 " " "
R231	300 OHM " " "
R232	4.7K " " "
R233	3K " " "
R234, R235	4.7K " " "
R239	100 OHM " " "
R301-R306	2.7K " " "
R401	1K " " "
R402	4.7K " " "
R406-R407	4.7K " " "
RM1	4.7K 10 PIN SIP
RM4, RM5	2.7K " " "
RM7	4.7K 8 " "
RM8	820 OHM " " "
RM9	1.8K 10 " "
RM14	4.7K " " "

DESIGNATION	DESCRIPTION
D101-D103, D105-10(	1N4148
Q101-Q103	TIP 110
Q104	2N4403
IC 1A	7406
" 4A	74LS273
" 5A	74LS374
" 6A	1KX8 RAM
" 7A	ROM/EPROM 0
" 8A	" " 1
" 9A	" " 2
" 10A	" " 3
11A	74LS245
" 12A	Z-80 CPU
" 13A	74LS08
" 4B	74LS244
" 7B	74LS138
" 8B	"
" 9B	74LS670
" 10B	74LS32
" 11B	74LS670
" 12B	74LS138
" 13B	"
" 14B	74LS174
" 6C	7407
" 10C	MC3403
" 11C	74LS04
" 12C	MC14024
" 13C	7427
" 14C	74LS367
" 3D	LM3900
" 6D	74LS02
" 7D	MC14016
" 8D	"
" 9D	"
" 11D	74190
" 12D	PROM SB2 A
" 13D	74166
" 2E	74LS244
" 10E	MC3403
" 11E	74161
" 12E	74126
" 2F	74LS244
" 3F	74LS191
" 4F	"
" 5F	"
" 6F	AY 3 8910
" 7F	"
" 8F	74LS191
" 9F	"
" 10F	"
" 11F	7474
" 12F	74S04
ICS 6A-ICS10A	24 PIN IC SOCKET
" 12A	40 PIN "
" 12D	16 PIN "
" 6F 7F	40 PIN "
J1, J2	20 PIN CONN. KK-100 (SIP)
	4 PIN " "
J3	5 PIN KK 100 RT ANGLE
	3 PIN " "
J4	13 PIN " "
	5 PIN " "
J5	18 PIN " "
	4 PIN " "
JW1, JW2	JUMPER WIRE
LED 3	YELLOW LED
SW1	10 POSITION DIP
SW3	8 " "
SW4	PUSH BUTTON SW
XTAL 1	16 MHZ CRYSTAL
MHQ101 MHQ103	SNAP



W/O FANNING KIT

DESIGNATION LIST

DESIGNATION	DESCRIPTION
R403, R404	33K 1/4W 5% CRB.

CROSS REFERENCE LIST

DESCRIPTION	QUANTITY	DESIGNATION	PART NO.
33K 1/4W 5% CRB.	2	R403, R404	0062-251B3-1XXX

NOTE: THIS DRAWING VALID FOR 'K' & 'L' VERSION SOUND I/O

CROSS REFERENCE LIST

DESCRIPTION	QUANTITY	DESIGNATION	PART NO.
33 PF 50V 5% AX CER	1	C144	0986-00800-0900
47 PF 50V AX CER	2	C128, C129	0986-00800-2800
100 PF 50V 5% AX CER	1	C142	0986-00800-1000
330 PF 50V AX CER	2	C161, C165	0986-00800-1300
.0022 MF 100V 10% MYLAR	12	C145-C156	0986-00800-1200
.047 MF 100V MYLAR	1	C139	0986-00800-2600
.01 MF 50V AX CER	50	CP2-CP12, CP14-CP33, CP35-CP46, CP48-CP51, C140, C141, C173	0986-00800-2000
.1 MF 50V AX CER	17	C112-127, C143	0986-00800-1100
1 MF 20V AX TANT	8	C157-159, C162-C164, C134, C137	0986-00800-1400
10 MF 25V AX TANT	16	CP34, CP52, CP53, CP201-CP204, C101-C103, C131, C138, C172, C166-C168	0986-00800-0700
470 MF 16V AX ELECT	4	CP1, CP13, CP47, CP54	0986-00800-2700
22 OHM 1/4W	1	R164	0062-063B3-1XXX
100 OHM "	1	R239	0062-110B3-1XXX
220 OHM 1/4W	17	R116-131, R162	0062-133B3-1XXX
300 OHM "	1	R231	0062-141B3-1XXX
330 OHM "	2	R160-R161	0062-144B3-1XXX
1 K "	3	R153, R227, R401	0062-179B3-1XXX
1.2 K "	3	R157, R158, R163	0062-183B3-1XXX
2.7 K "	6	R301-R306	0062-199B3-1XXX
3 K "	1	R233	0062-201B3-1XXX
4.7 K "	19	R101-R107, R165-166, R225-226, R228, R232, R234, R235, R402, R405, R406, R407	0062-211B3-1XXX
5.6 K "	12	R173-R178, R197-R202	0062-215B3-1XXX
10 K "	4	R155, R156, R146, R151	0062-227B3-1XXX
13 K "	6	R209-R211, R220-R222	0062-233B3-1XXX
24 K "	2	R179, R196	0062-245B3-1XXX
27 K "	2	R213, R224	0062-247B3-1XXX
33 K "	13	R135, R203-R208, R214-R219	0062-251B3-1XXX
100K "	2	R142, R148	0062-275B3-1XXX
180 K "	2	R138, R141	0062-287B3-1XXX
620K "	4	R144, R145, R149, R150	0062-313B3-1XXX
1 MEG. "	2	R152, R154	0062-323B3-1XXX
820 OHM 8 PIN SIP	1	RM8	0986-00805-0800
1.8 K 10 PIN SIP	1	RM9	0986-00805-0600
2.7 K 10 PIN SIP	2	RM4, RM5	0986-00805-0500
4.7 K 8 PIN SIP	1	RM7	0986-00805-0400
4.7 K 10 PIN SIP	2	RM1, RM14	0986-00805-0300
1N4148	6	D101-D103, D105-D107	0986-00801-0200
2N4403	1	Q104	0986-00802-0500
TIP 110	3	Q101-Q103	0986-00802-0400
74LS02	1	D6	0986-00803-7400
74LS04	1	C11	0986-00803-6900
74S04	1	F12	0986-00803-6600
7406	1	A1	0986-00803-7600
7407	1	C6	0986-00803-5900
74LS08	1	A13	0986-00803-7300
7427	1	C13	0986-00803-7200
74LS32	1	B10	0986-00803-6100
7474	1	F11	0986-00803-6700
74126	1	E12	0986-00803-6800
74LS138	4	B12-B13, B7-B8	0986-00803-6500
74161	1	E11	0986-00803-5100
74166	1	D13	0986-00803-5300
74LS174	1	B14	0986-00803-7500
74190	1	D11	0986-00803-9400
74LS191	6	F3-F5, F8-F10	0986-00803-5600
74LS244	3	B4, E2, F2	0986-00803-4800
74LS245	1	A11	0986-00803-6400
74LS273	1	A4	0986-00803-4700
74LS367	1	C14	0986-00803-7000
74LS374	1	A5	0986-00803-4600
74LS670	2	B9, B11	0986-00803-6300
AY-3-8910	2	F6-F7	0986-00803-8500
LM3900	1	D3	0986-00803-4900
MC3403	2	C10, E10	0986-00803-5000
MC14016	3	D7-D9	0986-00803-6200
MC14024	1	C12	0986-00803-7100
PROM SB2-A	1	D12	0986-00803-8200
RAM 1KX8 SUB.	1	A6	0986-00803-8000
ROM/EPROM 0	1	A7	OPTION KIT: UPRIGHT, MINI 0982-00803-3500
" 1	1	A8	
" 2	1	A9	OPTION KIT: COCKTAILS 0982-00803-3600
" 3	1	A10	
Z-80 (3880)	1	A12	0986-00803-5500
16 PIN IC SOCKET	1	ICSD12	0986-00804-1400
24 PIN " "	5	ICSA6-ICSA10	0986-00804-1600
40 PIN " "	3	ICSA12, ICSF6, ICSF7	0986-00804-1500
3 PIN KK-100 RT. ANGEL	1	J3	3000-16366-0300
4 PIN " "	1	J5	3000-16366-0400
5 PIN " "	2	J3, J4	3000-16366-0500
13 PIN " "	1	J4	3000-16366-1300
18 PIN " "	1	J5	3000-16366-1800
4 PIN CONN KK 156 (SIP)	2	J1, J2	0986-00804-1300
20PIN " "	2	J1, J2	0986-00804-1200
JUMPER WIRE	2	JW1, JW2	0986-00804-4000
YELLOW LED	1	LED 3	0986-00804-2000
SNAP's	3	MHQ101-MHQ103	0017-00007-0134
8 POSITION DIP SW.	1	SW3	0986-00805-0900
10 POSITION DIP SW.	1	SW1	0986-00805-1000
P.B. SW.	1	SW4	0986-00804-1700
16 MHZ CRYSTAL W/3RD LEAD	1	XTAL	0986-00805-1100

PROJECT ENG: CARY MEDNICK

DO NOT SCALE DWG	M.M 3/10 4/6/82	SOLAR FOX 1 PER	MIDWAY MFG. CO.
		ASS'Y DRAWING SOUND I/O A082-90908-L000	M051-00982-B009

